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# SYMPOSIUM ON THE NERVOUS SYSTEM: CENTRAL AND SYMPATHETIC

**Held at the Tercentenary Session of the Harvard Medical School on September 15, 1936**

## EXPERIMENTAL NEUROLOGY IN THE HARVARD MEDICAL SCHOOL

CHAIRMAN'S ADDRESS

BY WALTER B. CANNON, M.D.*

JUST fifty years ago last month, in August, 1886, Dr. Henry P. Bowditch, formerly Professor of Physiology in this medical school, gave an address before the Biological Section of the American Association for the Advancement of Science on the question, "What Is Nerve Force?" In that address he supported the opinion that "the study of the nervous system is the true field of battle for physiologists, all other investigations, however interesting and important, being of the nature of skirmishes, preparatory for and leading up to the final conflict in which we must engage before we can hope to gain a position from which nature's most mysterious processes are laid bare to our view." In the half-century since that opinion was expressed the battle has made considerable progress. We have learned much more about the biology of the nerve trunk, which Bowditch was discussing and which he studied in relation to its remarkable freedom from fatigue. Through the illuminating investigations of Adrian a principle, which Bowditch discovered in the functioning of heart muscle,—the all-or-none law—has been proved true also for impulses passing along the nerve trunk. And the conditions affecting reflex action, which Bowditch and his students investigated in the knee jerk, have been greatly extended by the numerous discoveries that have been made through the devoted labors and the genius of Sherrington.

Working in Bowditch's laboratory in the early 70's were William James and James J. Putnam. To James's insight we owe the first recognition of the principle of forward conduction in the reflex arc, and to Putnam an improvement of the pendulum myograph, which has become an important tool in revealing the time relations of neuromuscular events. Later, James, as a teacher of physiology and psychology, and Putnam, as a neurologist, spread the influence of their early experience.

Such are some of the sources that stimulated an interest in the functioning of the nervous system among physiologists, psychologists and clinical specialists in Boston. Alexander Forbes, who was one of Sherrington's early students at Liverpool, brought back to the Harvard Physiological Laboratory the careful technic of a master and, adding to it an ingenious employment of electrical methods, he applied it with a high degree of productiveness to a study of spinal reflexes. Hallowell Davis, returning from an inspiring experience in Adrian's laboratory at Cambridge, found in Forbes's methods the opportunity he desired for a careful examination of the phenomena of impulse conduction in nerves. Forbes and Davis have labored together, unraveling some of the complications of reflex responses and, more recently, tracing the course of nerve impulses along pathways in the brain substance—especially the impulses originating in the ear. The latest interests of Dr. Davis particularly, related to the peculiar rhythm in the cerebral cortex, which yields the encephalogram, we shall learn about later from his own words.

Another interest, which I think can be traced ultimately to Sherrington's labors, is that fostered by Crothers in his study of birth injuries of the nervous system. While examining young children sent to him with the diagnosis of infantile paralysis, he found that besides being paralyzed, so far as voluntary control of leg muscles was concerned, they were anesthetic below a certain level, and that if adequately stimulated in the anesthetic area a typical mass reflex occurred. Clearly this was not the proper behavior of a patient with infantile paralysis. It was quite the proper behavior of a spinal human being. The tracing of these cases back to the time of birth and the discovery that they were instances of breech presentation and explicable as consequences of ruptured spinal cord were important contributions to the neurology of infancy and childhood.

A strong stimulus to interest in neurology was provided when Harvey Cushing returned to this medical school. During the years of his service in the Department of Surgery he kept in close touch with the Surgical Research Laboratory and inspired a series of enterprising and energetic young investigators to carry on studies related to clinical problems in neurosurgery.

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There, Weed, Horrax, Tracy Putnam and others were led into understanding and appreciation of the nature of productive scholarship by actual experience, and were started on their several ways toward careers in which neurologic interests have played a prominent, if not a dominant, role.

Still another line of influence had a natural development in the course of researches in the Physiological Laboratory. Studies started just forty years ago this autumn, with the then newly discovered roentgen rays, promptly revealed that the digestive process is very easily inhibited by emotional excitement. These observations were followed by an examination of the functions of the alimentary canal after section of the vagus nerves and the splanchnics. The persistence of the typical motions of the stomach and intestines after all nerve connections had been severed, even though outbursts of rage or depressive states were prevailing, began to stir an interest in the part played by the autonomic system in the organism. At the time it seemed quite rational to disconnect the digestive tract from the meddlesome sympathetic system in order that the beneficent course of digestion might be freed from the disturbances which that system might induce.

Further interest in the sympathetic system was roused when it became clear that in the normal animal the disturbances of digestive function continued for some time after the occasion for them had disappeared. How could the phenomenon be explained? Might it not be possible that the persistence of the effects for a considerable period after the stimulus had ceased to act was due to liberation of adrenin from the adrenal medulla? Secreted adrenin as a simulator of sympathetic impulses might cooperate with those impulses and by continuance in the blood stream might prolong the sympathetic influence. Whether that explanation could be appealed to depended, of course, on whether, in fact, emotional upsets were accompanied by medulliadrenal secretion.

On this occasion, when I am merely sketching the background of interest in the nervous system as it developed in the Harvard Medical School, there is no reason for entering into the details of a long controversy, which centered on the question whether sympathetic impulses aroused in natural circumstances have the same effect in discharging adrenin into the circulation as sympathetic impulses aroused by electrical stimuli. Suffice it to say that various investigators, in widely separated parts of the world, using a variety of methods, have supported the evidence presented by the Harvard group, and that, although twenty years have passed since that evidence was seriously questioned, no one has supported the views of the critics.

In connection with researches on the influence of emotional excitement on adrenal secretion, a method of securing the physiologic manifestations of rage, displayed to a supreme degree, was discovered, which has had important consequences. By swift destruction of the cerebral cortex under brief ether anesthesia the lower centers of the brain are released from superior control. Under these circumstances a "sham rage" or quasi-emotional state soon develops, having all the characteristics of natural rage, both in its visceral and behavioral aspects. Bard was able to show that the pattern of this complex of activities is located in a small region in the lower posterior portion of the diencephalon. These observations have led to significant new experiments, to new revelations of the locus of emotional expression and to a better understanding of the interplay between modifiable cortical functions and stereotyped reactions on the emotional level. Much of the later growth of interest in this realm of investigation Bard and his associates have promoted at Johns Hopkins.

The controversy over the question of emotional stimulation of adrenal secretion led to the development of the denervated heart as an indicator of increased adrenin in the blood. And that, in turn, led to two new lines of research. Let me trace the unfolding of these consequences.

The heart, completely disconnected from the central nervous system, is relatively insensitive to changes of blood pressure, the presence of muscular metabolites or even alterations of temperature within the physiologic range; but it is extraordinarily responsive to slight increases of adrenin. By use of this indicator, not only strong emotions, but also cold, hypoglycemia, asphyxia and "painful" stimulation, all provocative of sympathetic impulses, were shown to be effective in discharging adrenin from the adrenal medulla, as demonstrated by the faster heart beat.

After the adrenal glands were rendered inactive the quick, large increase of the rate of the denervated heart, which had been the characteristic cardiac reaction before, wholly disappeared. The disappearance could not have been due to the operative interference alone, for the animals continued living quite normally in the laboratory for an indefinite time. The vagal and sympathetic connections of the heart had been cut with aseptic precautions, one adrenal had been removed and the other denervated; but, whenever these animals were exposed to the same conditions that previously accelerated the cardiac beat, the typical acceleration did not occur.

There was, however, a belated and minor increase of heart rate, seen characteristically some

minutes after a brief bout of excited struggle. This phenomenon was so regular in its appearance that it definitely challenged explanation. The search for the cause of the slow acceleration of the denervated heart was long and tedious. Only after all the sympathetic system had been removed did the phenomenon disappear. And then two courses were presented. There could be a study of the physiology of the new organisms that had been produced—well-developed mammals (dogs, cats and monkeys) quite deprived of their sympathetic systems—or a study of what made the denervated heart accelerate, in the absence of adrenal secretion, whenever sympathetic impulses were discharged.

The first of these alternatives was chosen for immediate attention. The general result of researches on sympathectomized animals was support of the concept that the sympathetic system acts as the governor of steady states in the fluid matrix or internal environment of the organism. On the sympathetic impulses depends the maintenance of uniformity of body temperature and of the acid-base relations, protection against hypoglycemia and other related functions—all directed toward uniformity of the body fluids or homeostasis, when that uniformity is seriously endangered.

The second of the alternative research plans was undertaken about six years ago. It was soon found that ether anesthesia had a very depressant effect on whatever the agent was that caused the denervated heart to beat faster when sympathetic nerves were stimulated. If experimental conditions were so arranged that the anesthetic was avoided, excitation of various areas of sympathetic innervation—the tail hairs or the gastrointestinal tract, for example—would be followed by an acceleration of the denervated heart. Shutting off the blood supply to a stimulated region deferred the effect until the circulation to the part was restored. Obviously, there was produced at the effectors under control of the sympathetic system, when sympathetic impulses affected them, a substance that, carried in the blood stream, was able to stimulate the heart. The substance was given the name, sympathin. This discovery associated the Harvard group with workers in Austria, Belgium and England, who are eagerly at work on one of the latest advances in physiology—the chemical mediation of nerve impulses.

It is a source of considerable satisfaction that the boundaries between departments in the University have proved to be obscure and indefinable—in short, they have not been, in the least degree, barriers that have made cooperation difficult. To illustrate this fact from the experience of the Department of Physiology alone, let me say that representatives of the Department of Psychology in Cambridge and of Otology in Boston (Dr. Lurie) have worked with Dr. Davis; Dr. Cobb, as a neuropathologist, has worked with Dr. Forbes; Dr. Rioch of the Department of Anatomy has collaborated wholeheartedly with Dr. Bard and Dr. Rosenblueth. And a Neurological Supper Club, composed of physiologists, psychologists, neurologists, psychiatrists and anatomists, meets monthly during the academic year for exchange of knowledge and interpretations and for frank discussion of new work. A spirit of mutual interest and collaborative effort prevails now among our investigators and students of neurology, as it has prevailed in the past and, I earnestly hope, as it will continue to prevail in years to come.

Such is the general background of the present labors and attentions in the realm of the nervous system in the Harvard Medical School and in related hospitals. Let us now turn to a consideration of some of the special reports of these labors. A glance over the program will reveal that of the eight papers the first is concerned with the surgery of the sympathetic nervous system, the next three with chemical mediation of nerve impulses, the two which follow with the electrical phenomena of the brain and the last three with circulatory conditions that may affect the nervous system.

## RECENT DEVELOPMENTS IN THE SURGERY OF THE SYMPATHETIC NERVOUS SYSTEM

BY JAMES C. WHITE, M.D.*

DR. CANNON has asked me to speak about recent developments in the surgery of the sympathetic nervous system and in particular those aspects that have been of especial interest to the men working in this school. It is very lucky for us who are doing neurosurgery in Boston that the pioneer work in this branch of neurophysiology, done by Claude Bernard, Gaskell and Langley, has been continued at Harvard in the laboratory of Dr. Cannon. These investigations have shown the extraordinary way in which the body adapts itself automatically to an adverse environment. They have further demonstrated that the control of homeostasis is dual—nervous and hormonal. Recent applications of some of these findings have brought out very strikingly the immediate value to the clinician of fundamental laboratory work. I am very

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glad to have this opportunity to discuss some of the interrelations between the laboratory and the clinic and to express our deep indebtedness for the help we have received from Dr. Cannon's department.

*Raynaud's Disease.* Attacks of vasospasm were first described by Maurice Raynaud in 1862. Royle, of Australia, in attempting sympathectomy for spastic paralysis, accidentally discovered the vasodilation that results in hands and feet when the vasoconstrictor pathways are interrupted. His methods were improved on by Adson, who has shown the most effective way of producing a lasting sympathetic denervation of the upper and lower extremities. While lumbar ganglionectomy results in complete and permanent relief of vasospasm in the feet, complete vasodilation in the hands after removal of the inferior cervical and the first and second thoracic ganglia has been found to last for less than a week, even though suppression of sweating and pilomotor activity in the hands proves that the smooth muscle has been deprived of its nerve supply.

**To illustrate this point, a colored lantern slide was shown of a young woman with severe Raynaud's disease. She had had bilateral cervicothoracic ganglionectomy, as well as bilateral lumbar ganglionectomy. The feet had remained constantly warm (85°-90°F.) and of normal color. The hands, as shown in the colored slide, were deeply cyanotic, and the temperature of the finger tips was 75°F. in a room at 70°F. The patient herself felt that the result on her feet had been perfect, but that her hands were little better than before the operation.**

This recurrent vasospasm in the denervated arteries of the hand offered an insuperable difficulty for nearly a decade, until Dr. Norman Freeman, who had been National Research Fellow in Dr. Cannon's laboratory, suggested the possibility of sensitization of smooth muscle in the denervated arterial walls to adrenin. It will be remembered that this peculiar reaction on the part of smooth muscle had been observed by T. R. Elliott and by Meltzer and Auer twenty years ago. Here are some of the experiments that were carried out by Drs. Freeman, Smithwick, Okelberry, Whitelaw and me to study the influence of circulating sympathomimetic hormones on denervated arteries.

**A series of lantern slides was shown depicting the effect of cutting the vasoconstrictor nerves to the rabbit's ear. (1) Twenty-four hours after section of the postganglionic fibers*, with complete vasodilation. (2) A week after postganglionic section. In these rabbits the vessels in the operated ear were dilated when the animal was warm and undisturbed, but, as soon as he struggled or became cold or frightened, the vessels on the operated side became fully constricted. (3) A rabbit, similar to that in the second slide, after inactivation of the adrenals. Here the vessels of the denervated ear remained dilated. (4) A rabbit in which, instead of postganglionic section, the preganglionic fibers had been cut. In these animals there was little sensitivity to adrenin, and the vessels of the ear remained widely dilated, even when the rabbit was struggling, frightened or cold. (5) A monkey in which one arm had been denervated by section of the preganglionic fibers, whereas on the opposite side the postganglionic vasoconstrictor neurons had been cut and allowed to degenerate. After excitement or intravenous doses of adrenalin, this animal showed a minimal fall in temperature of the hand on the side where the preganglionic fibers were cut, but a maximal fall in the side on which the postganglionic fibers had degenerated.**

These experiments show very clearly that degeneration of the postganglionic component of the vasoconstrictor pathway so increases the sensitivity of the denervated arteries to the sympathomimetic hormones, adrenin and sympathin, that intense vasospasm may recur when the animal struggles or becomes chilled or frightened. No such exaggerated response takes place, however, when the vasoconstrictor pathway has been interrupted in its preganglionic neuron. These experimental observations have now been completely corroborated by Grant of London and by Ascroft, another Englishman working in Dr. Fulton's laboratory at Yale. The human and monkey determinations also tally in a quantitative way with the findings of Hampel in Dr. Cannon's laboratory. He measured the pull of the smooth muscle in the denervated nictitating membrane of the cat on injecting adrenalin, finding that the force of contraction was over twice as great after degeneration of the postganglionic fibers as after that of the preganglionic fibers.

From the anatomic standpoint, lumbar ganglionectomy in the human being is a preganglionic section so far as the foot is concerned, and the resultant sensitization to adrenin is slight; whereas cervicothoracic ganglionectomy causes degeneration of all the postganglionic fibers to the brachial plexus and the sensitization is great.

**A lantern slide was shown to bring out the different degrees of vasospasm that follow the injection of adrenalin in a patient after cervicothoracic and after lumbar ganglionectomies. The temperature of the fingers after cervicothoracic ganglionectomy (postganglionic section) fell**

*In order that the average reader, who is not a neurologist, may understand the terms postganglionic and preganglionic, it is important to define them here. The vasoconstrictor impulses are transmitted from the lateral horns of gray matter in the spinal cord to the smooth muscle in the blood vessels over a chain of two neurons. The upper preganglionic neuron cells send their axons out over the ventral spinal roots and white rami communicantes into the paravertebral chains of sympathetic ganglia from the upper thoracic down to the second lumbar segments. In the sympathetic chains these axons run upward or downward through a number of ganglia before establishing synapses with the cells of the postganglionic neurons to the extremities. These synaptic connections are made in the superior cervical ganglion with the postganglionic neuron cells which send their axons to the blood vessels of the ear, in the inferior cervical and upper two thoracic ganglia with those to the hand, and in the lowest lumbar and upper three sacral ganglia with those that supply the foot. The postganglionic fibers emerge from these ganglia over the gray rami communicantes and enter the peripheral nerves over which they are distributed to the blood vessels in the extremities.

from 90° to 83°F. whereas the temperature of the toes (preganglionic section) fell only from 91° to 89°F.

Dr. Smithwick at the Massachusetts General Hospital and Mr. Telford of Manchester have recently devised an operative technic for preganglionic section of the vasoconstrictor fibers to the upper extremity. During the last two years some forty of these operations have been performed, and it is now established that after this more physiologic procedure the results in the hand can be just as satisfactory as those in the foot.

In contrast to the preceding lantern slide, a chart was shown illustrating the fall in temperature of the digits following adrenalin injection in a patient after Dr. Smithwick had performed a preganglionic section of the vasoconstrictor fibers to the upper extremity, as well as lumbar ganglionectomy. In this instance there was only a minimal fall in temperature of the fingers as well as of the toes.

*Hyperhydrosis.* The sweat glands, like the arteries, are innervated by the sympathetic nerves. Unlike those to the arteries, however, these fibers are cholinergic, rather than adrenergic.* Hence, these glands do not become sensitized to adrenin after sympathectomy. A few unfortunate people suffer from exaggerated sweating of the hands and feet. Charles Dickens must have had such an individual in mind when he wrote "David Copperfield." In his description of Uriah Heep, Dickens says, "He frequently ground the palms against each other as if to squeeze them dry and warm, besides often wiping them, in a stealthy way, on his pocket handkerchief." This condition may become so severe that beads of perspiration drip from the fingers, and the victim is forced to wipe his hands before he can touch anything. This is particularly embarrassing to medical men and people doing secretarial work, four of whom we have relieved by thoracic sympathectomy. The result in each case has been most gratifying.

*Abnormal Visceral Activity.* Turning from conditions of abnormal vasomotor and sudomotor activity, I should like to discuss next the treatment of several forms of abnormal visceral activity, in which the application of physiologic experiments has been of similar value. At the lower end of the intestinal tract, hypertonicity of the rectal sphincters and diminished tone of the musculature in the lower colon result in Hirschsprung's disease or congenital megacolon. Since the original report of Wade and Royle, this condition has been relieved with striking success by cutting the sympathetic fibers in the inferior mesenteric and superior hypogastric plexuses, which close the involuntary sphincter and reduce the tone of the descending colon.

*That is to say the sweat glands are influenced by acetylcholine, rather than by adrenin and sympathin.

X-rays were shown of the colon in a child with typical Hirschsprung's disease. No barium could be evacuated from the enormously dilated colon on voluntary effort, but after spinal anesthesia there were complete emptying and active peristalsis. After sympathectomy the colon had become distinctly smaller, and there was evidence of active peristalsis on introduction of the barium. After a voluntary movement of the bowels, the colon was entirely empty.

It is unfortunate that resection of the superior hypogastric plexus does not similarly improve the function of the paralyzed bladder, as was formerly believed. From the more recent experimental investigations of Graeme Robertson and Denny-Brown it is apparent that the sympathetic fibers, the so-called "bladder filling" nerves, play a very minor part in bladder inhibition. The major role in micturition is played by the parasympathetic sacral nerves and the intrinsic nerve plexus in the bladder wall. This explains our failures to improve the emptying power of the bladder, after injuries to the spinal cord and cauda equina, by presacral neurectomy.

*Visceral Pain.* We have now considered the principal applications of sympathetic neurosurgery to conditions arising from disordered homeostatic function. The classical findings of Gaskell, Langley and Cannon have demonstrated that the autonomic nerves constitute an efferent motor system for the automatic correlation of visceral activity. However, the clinical experiences of the last decade have shown that nearly all forms of visceral pain can be relieved by section of the regional sympathetic trunks. The explanation of this paradox lies in the recent work on the nerve impulse and the clear-cut demonstration that typical sensory fibers run to the viscera along with the sympathetic nerves. The former are simply somatic afferent fibers, which run in continuity through the sympathetic chains to their cells of origin in the spinal posterior root ganglia. The visceral nerves must therefore be considered as mixed sensory-motor pathways, with a preponderance of sympathetic motor elements and a minority of somatic sensory fibers. Brouwer, in his Herter Lecture of 1926, expressed the relation of visceral pain to the sympathetic nervous system in this way: "In discussing the autonomic nervous system many physiologists and neurologists consider only the centrifugal side, that is, they speak about the sympathetic nervous system in so far as it has been analyzed by Langley. But in my opinion this is too narrow. We know that there are also many sympathetic fibers, for instance, in the intestines, which send impulses in the direction of the central nervous system." Speaking from my own point of view, it seems logical to refer to these aberrant centripetal fibers as the viscerosensory nerves and to bear in mind

that, strictly speaking, they belong to the somatic system.

The bearing of this recent anatomic discovery on the treatment of intractable pain is best exemplified in the surgical attempts to relieve angina pectoris. This begins with the suggestion of François-Franck that cardio-aortic pain could be interrupted by resection of the cervical sympathetic chains. Jonnesco and others, who followed in his wake, showed that this was true in only 58 per cent of patients. The failure of this operation in such a large proportion of cases could not be explained by what was then known about the cardiac nerves.

Here again the physiologist and the anatomist came to the help of the surgeon. Dr. Cannon, with Lewis and Britton, operated on a cat and showed that when all the known cervical sympathetic nerves were cut, the vagi divided and all hormonal influences had been removed, the heart rate would still speed up when the cat was confronted by a barking dog. This reaction was eliminated when the upper thoracic ganglia were resected. At about the same time a series of delicate rami running to the cardiac plexus from the second, third, fourth and fifth thoracic sympathetic ganglia was discovered by Braeucker in Hamburg, by Jonnesco and Enarchesco in Bucharest and by Kuntz and Morehouse in this country. The importance of these direct cardiac nerves in the transmission of pain from the heart was shown by Garrey and Atkins, two tutorial students working with me in Dr. Drinker's laboratory.

A series of lantern slides was shown depicting the effects of various neurosurgical procedures on cardiac sensation in dogs. Temporary occlusion of the anterior descending branch of the left coronary artery caused definite signs of discomfort in control animals. Section of the vagi or of the intercostal nerves lateral to the junction of the cardiac rami was without effect on the transmission of afferent impulses resulting from ischemia of the myocardium. After removal of the inferior cervical and first thoracic ganglia, the type of sympathectomy still advocated by Continental surgeons for angina pectoris, there was only a slight reduction in sensation. On the other hand, when the upper four thoracic sympathetic ganglia or the upper five posterior thoracic roots were resected bilaterally, there was no evidence of any sensation to experimental coronary occlusion.

Our clinical experience with 50 cases of cardio-aortic pain in man has shown that these physiologic findings in the dog are directly applicable to the human being. When the upper five thoracic ganglia or the corresponding posterior spinal roots have been destroyed, pain referred to the ipsilateral precordium, neck and arm has disappeared. This has followed in each of 9 cases where the posterior spinal roots have been cut or the thoracic ganglia excised; but, as the operation is too severe for patients with advanced coronary disease, we have settled on Mandl and Swetlow's method of paravertebral alcohol injection as the most practical procedure. Here the results in 38 cases have shown:

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|---|---|
| Good (100-90 per cent relieved) | 68 per cent |
| Fair (90-50 per cent relieved) | 16 " " |
| Improved (50-25 per cent relieved) | 5 " " |
| Failures | 8 " " |
| Deaths (1 case) | 3 " " |

To all of us that have observed these patients it has been apparent that cardiac pain is uniformly interrupted after accurate injection of the upper thoracic sympathetic ganglia and their visceral rami. This is a difficult procedure and cannot always be successfully performed. The results, however, are far more satisfactory than those following the older cervical sympathectomy, which anatomically results in an incomplete sensory denervation of the heart.

In 3 cases of extremely painful aneurysm of the aortic arch, injection gave a successful result in each. The first presented an unusual problem in referred pain, as the patient complained of a constant burning sensation not only in his precordial region, but in his neck and posterior scalp as well. Novocain infiltration of the upper two thoracic sympathetic ganglia gave complete relief for thirty-six hours, which was made permanent by a subsequent injection with alcohol.

In peculiar types of visceral pain, where we have been at a loss to know which segments to inject, we have explored the pathways of pain transmission by diagnostic injections of novocain. This method has proved to be of the greatest value in investigative work on human beings, not only for pain transmission, but for establishing the neurogenic relation in doubtful cases of vasospastic arterial disease and disordered visceral motility. In difficult situations of this sort the neurosurgeon is deeply indebted to the pharmacologist for the preparation of a safe drug, which can be used to block any desired portion of the sympathetic chain long enough to test the function of the axons that traverse it.

It has been very fascinating for me to trace the influence of the fundamental sciences on the solution of the practical problems in visceral neurology. I hope that these examples will serve to emphasize the neurosurgeon's debt to the physiologist, the anatomist and the pharmacologist.

# MYASTHENIA GRAVIS

BY JAMES B. AYER, M.D.*

MYASTHENIA gravis is a mysterious illness —I will not say disease, because it may well not be an entity. A brief review of its characteristics will be given in order to provide a background for the better understanding of rational treatment. Myasthenia gravis is distinguished by recurring attacks of weakness in the striated muscles, commencing without obvious cause and progressing with remissions and exacerbations over a period, usually of many years. Not infrequently an acute attack may lead to death in a few weeks from paralysis of the muscles of deglutition and respiration, the usual fate also of the long-standing case.

It is described in textbooks as a disease of youth, but we are now certain that its onset is not uncommon in the fifth, sixth and even seventh decades, with a slightly greater incidence in females. No obvious cause for its onset is apparent, although preceding infection and pregnancy are recorded often enough to merit emphasis. Exaggeration of symptoms at the menstrual period is also noted.

The pathology of the condition seems to be limited to two findings: (1) collections of lymphocytes, "lymphorrhages", found between muscles and muscle fibers, the muscles themselves remaining normal; and (2) the frequent finding of an enlarged thymus gland, usually described as hyperplastic. The nervous system, central and peripheral, is intact, although it must be admitted that anatomic study of the nerve end plate is still inadequate.

The fully developed clinical picture is readily recognized. The patient starts the day well, but cannot finish breakfast because of difficulty in chewing and swallowing. There follows, as the day advances, a progressive drooping of the eyelids, accompanied perhaps by diplopia. Involvement of the pharyngeal muscles results in hoarseness, sometimes so severe as to abolish speech completely, and the face frequently assumes an immobile masklike expression. Many patients cannot hold the head erect, or slouch from weakness of trunk muscles; arms and legs weaken on trivial exercise. When all of these symptoms are exaggerated on use and improve with even short rest, the picture is almost pathognomonic.

When symptoms are slight in degree, or confined to few muscles, the diagnosis may well be confused with encephalitis, brain tumor, nuclear palsies of different types, polyneuritis or with other of the myopathies.

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Our only laboratory aid until recently has been the myasthenic reaction of Jolly, that is, rapid fatigue of muscles on faradization with recovery to electrical stimulation on rest of 30 to 60 seconds. Unfortunately this test often fails, and it cannot be readily applied to the ocular muscles, which are frequently the first to be affected. Lindsley found in four of our cases that the electrical response of single motor units was altered in a way that he considers typical of myasthenia. The curves obtained show a progressive irregularity and weakness of muscular response, while maintaining the rhythm of nerve conduction. These electromyographs, he feels, strongly suggest that the seat of disorder is the myoneural junction. Lately there has been made available the prostigmin test, the details of which will be taken up by Dr. Viets. Suffice it to say that we have come to rely more and more upon this test as probably specific for myasthenia gravis.

With no significant pathology and no pathogenic factors of certainty, treatment to date has been largely empirical and is still in the experimental stage, although the disease has long been considered a disturbance of muscle rather than of nerve. The forms of treatment so far devised may roughly be divided into three periods:

1. For many years absolute rest was the order of the day, with the early institution of tube feedings, in order to spare the muscles of deglutition and to maintain nutrition. Under this regime many a patient, by being tided over a serious period, was enabled to live on with limited activity, and the method is still in use. During this time, however, many patients were treated with strychnia in massive doses, and good results were obtained by competent observers.

2. The endocrine gland period, which had considerable backing because of the points mentioned in connection with thymus and gonadal glands, next became the center of attention. In this category a few cures were reported following x-ray treatment to the thymus, one from our clinic.

3. In 1930 Edgeworth made an epochal observation upon herself as to the benefit of ephedrin, since corroborated by many observers; and in 1934 Walker introduced physostigmin, to be followed later by an analogous drug, prostigmin. This last drug, as you will see for yourselves in a moment, is prompt in its action, but the effect is not lasting and the ill effects of continued use are definite. With this

drug we seem to meet confirmation of the physiologic concept that the disease is a disturbance at the myoneural junction. What may lie behind this is still not clear.

The treatment of our patients with prostigmin has been carried out by Drs. Sydney Stillman and Roger Mitchell, and I will ask Dr. Mitchell to give you the details.

Dr. Ayer then demonstrated the effect of prostigmin in a patient.

## EXPERIENCE WITH ORAL PROSTIGMIN THERAPY IN MYASTHENIA GRAVIS

BY ROGER S. MITCHELL, M.D.*

As you have already heard, the new drug, prostigmin, has been available for about eighteen months and in tablet form for oral therapy for only six months. Necessarily, then, our experience is limited and our observations subject to change as knowledge and experience in this new field increase.

We have been particularly interested in the oral use of prostigmin for continuous treatment. There were only two cases thus treated to be found in the literature; these patients were given 90 milligrams a day for 2 to 3 months. There are also three cases reported that were given "substance 36", another synthetic analogue of physostigmin and prostigmin, in doses of 100 to 200 milligrams a day for 3 to 5 months. Good results were obtained in both series.

We have given oral prostigmin to 9 of our 17 cases of myasthenia gravis, and the results have been very satisfactory so far. In every case the beneficial effect has been greater than on any previous medication, including ephedrin, glycin and parenteral prostigmin.

The action comes on in about 30 minutes, reaches its height in about 1 hour, begins to wear off in 2 hours and is usually gone in 3 to 5 hours. This beneficial effect has been carefully controlled by the substitution of other drugs and inert substances without the patients' knowledge. We have used doses varying from 60 to 150 milligrams a day in divided doses. The average dose has been 90 milligrams. The action seems to be roughly quantitative, more being needed in the severer cases, so that there is no regular dose applicable to all patients. Its advantages over parenteral prostigmin are that it is taken by mouth and that it may be more easily given in frequent doses, thereby avoiding fluctuations in symptoms. We have obtained our best results on five or six daily doses, the first before rising in the morning and the last just before retiring. It is important that meals be taken about 30 to 40 minutes after a dose. Despite the pronounced beneficial effect of this treatment, it is important to observe that the results of treatment are decidedly more satisfactory if the patients continue to get as much rest as possible and avoid overdoing in any way. When a regime of oral prostigmin is carefully and properly planned and adequate rest is obtained, most of our patients have been able to return to a fairly satisfactory routine of daily life.

That there are transient untoward effects from prostigmin has already been mentioned. I shall mention the untoward effects that we have observed in our experience with oral prostigmin. These are nausea, salivation, perspiration, dizziness, loose bowel movements, occasional muscular aches and pains, and, rarely, abdominal cramps, vomiting and diarrhea. None of these symptoms last for more than 15 to 30 minutes.

Fortunately the simultaneous administration of atropin or belladonna effectively abolishes these untoward symptoms. The reason for its use is the experimental finding that atropin reduces the autonomic effects of prostigmin, that is, the muscarin effects of acetylcholin. In large doses it also diminishes the anticurare effect. Therefore, if our present theory of the pathogenesis of myasthenia gravis is correct, atropin should also diminish the beneficial effects of prostigmin. Clinically we have not observed any significant diminution in the beneficial effect of prostigmin from the simultaneous use of this drug. Nevertheless, because of the theoretical considerations, we feel it is advisable to determine and use the minimum dose of atropin or belladonna effective in counteracting the untoward effects of prostigmin. This dose, in our experience, has varied from 10 to 30 minims of the tincture of belladonna or from 1/200 or 1/150 grain of atropin sulfate, two to three times a day.

Other drugs have been used simultaneously with oral prostigmin. Ephedrin seems to add nothing to the effect of prostigmin. Glycin has not been tried. Potassium chloride, however, has been found to be of value.

Potassium chloride was first used alone in myasthenia in large doses of 6 to 12 grams a day, because of the results of physiologic experimentation on the humoral transmission of excitation through sympathetic ganglia. Moderate beneficial effects were reported. Later it was found by some investigators to act apparently as an adjuvant to parenteral prostigmin. For this reason we have tried similar daily doses of potassium chloride in all of our cases treated with oral prostigmin. Five of the 9 cases seemed to be benefited by its simultaneous use, 2, in fact, feeling that prostigmin had little effect without it. In the other 4 the use

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of potassium chloride made no difference one way or the other.

Briefly in regard to parenteral prostigmin therapy, there have been 11 cases reported in the literature treated with 0.5 to 6.0 milligrams, subcutaneously, a day for 2 to 17 months with good results. We have treated only 1 patient over a period of time. He was given 0.5 milligram intramuscularly twice to three times a day, and on this regime did fairly well. Since then, however, he has done definitely better on oral therapy. Three other patients, whom we started on intramuscular prostigmin therapy, did fairly well while in the hospital, but upon going home got into difficulties with their injections and had marked fluctuations in symptoms. Attempts to straighten them out were not very successful, and finally this form of treatment was given up. It has been our experience that prostigmin administered intramuscularly has certain distinct advantages over its subcutaneous use. The action of the intramuscular dose comes on more rapidly, is more effective and seems to last somewhat longer. There is no question that parenteral prostigmin has a definite indication in emergencies that occasionally arise during the clinical course of a typical case of myasthenia, and on two occasions we have felt that its timely use was a life-saving measure.

In summary, we feel that oral prostigmin is the most feasible and reliable method of treatment of myasthenia gravis available today. It does not completely relieve the patients, but has made it possible for all of our 9 cases to get along quite well at home without continuous medical supervision. Intramuscular prostigmin is a valuable emergency drug for use in periods of marked exacerbation. Atropin and belladonna are effective in controlling the transient untoward effects of prostigmin, when present, and should be given in the smallest effective dose. Potassium chloride is worth trying in every case to determine if it acts as an adjuvant to prostigmin. Finally, it is well to add that in this series of cases we have seen no indication so far of increasing tolerance to the drug, of diminution in degree or frequency of spontaneous remissions or of more rapid progression of the disease.

## THE PROSTIGMIN TEST IN MYASTHENIA GRAVIS

### Second Report

BY HENRY R. VIETS, M.D., AND ROGER S. MITCHELL, M.D.

THIS paper appeared in the *Journal* of December 3, 1936.

## THE ELECTRICAL ACTIVITY OF THE HUMAN BRAIN*

### ABSTRACT

BY HALLOWELL DAVIS, M.D.†

THE human brain generates electrical potentials strong enough to be detected through the intact skull. A record of these potentials is analogous to the familiar electrocardiogram and, like the latter, furnishes a convenient external index of the activity of a hidden organ. The potentials from most human heads amount to only some fifty millionths of a volt, but fortunately this is well within the range of modern amplifiers, and we may obtain records on photographic film or traced directly in ink on a moving ticker tape. In such records, waves usually recur at certain regular frequencies. Most prominent is a rhythm of approximately ten a second, nearly constant in frequency for any individual. This is known as the "Berger rhythm," or the "ten-cycle rhythm," produced by the "alpha rays". Less prominent, because lower in voltage, is a faster frequency of about twenty-five a second, caused by what Berger calls the "beta waves".

We are justified in speaking of the electrical record as the "cortical electrogram", since the potentials originate almost entirely in the gray matter of the cortex. The pattern is practically the same whether we record from the intact scalp, from the underlying periosteum, from the dura or from the outer layers of the cerebral cortex. According to Kornmueller, when the exploring electrode on the exposed brain or dura of animals crosses a cyto-architectonic boundary, an abrupt change of pattern is seen.

The human patterns of activity may be modified by physiologic and psychologic states. In some individuals, lying quietly with eyes closed and mind at ease, the ten-a-second rhythm will run almost continuously. Like the heart beat, it is accelerated by a rise in temperature, but in many individuals, unlike the heart beat, it is interrupted temporarily every few seconds. It is suppressed by opening the eyes, but as a rule it eventually returns even with the eyes

*This paper was originally read before the American Medical Association on May 14, 1936, and will appear in full in the *Archives of Neurology and Psychiatry*. Many of the statements are based on the findings of other investigators, not cited in this abstract. Pauline A. Davis has carried out most of the work in our laboratory on normal adult patterns and on the identical twins.

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still open. Apprehension or nervousness may prevent its appearance, and concentrated mental effort, particularly if there is an emotional element of hurry or embarrassment, may suppress it. Drowsiness may cause the ten-a-second waves to disappear, and slower, larger, less regular waves to take their place. Unconsciousness in general—whether from early sleep, cerebral anemia, fainting or anesthesia—is associated with larger and slower waves than the conscious state. Babies under six months of age give large random waves rather than regular rhythms. The latter begin to appear at about six months, but are slower than the adult frequency, which is not established until ten or twelve years. No relation has been established between the characteristics of the cortical electrogram and sex, mental age or intelligence.

Under standard conditions, an individual reproduces on successive tests his own type of record, which may be characterized by the presence or absence of a regular ten-a-second rhythm, by the percentage of time that this rhythm is present, by the prominence of other waves, such as the beta waves, whether or not of regular frequency, and by the general level of activity, which is usually between 20 and 75 microvolts. We have studied 23 individuals on two separate occasions and 10 others on three to five occasions, and have found that each subject regularly reproduces his own type of record. Some individuals show almost continuous ten-a-second rhythm, others show it part of the time, and some show it scarcely at all. We have studied 8 pairs of identical twins and find that in every case identical twins show similar patterns. Brothers and sisters that are not identical twins do not always show patterns of the same type. We believe that the cortical electrogram reveals some inborn features or pattern of cerebral activity and that possibly it discloses an organic, hereditary characteristic, with which may be associated other mental or neurologic characteristics.



## THE ELECTRICAL ACTIVITY OF THE BRAIN IN EPILEPSY

ABSTRACT

BY FREDERIC A. GIBBS, M.D.,* AND WILLIAM G. LENNOX, M.D.*

BY recording the electrical activity of the brain it is now possible to go back of the jerking muscles of an epileptic seizure and obtain evidence of the basic neurologic disturbance that underlies the disorder. In certain cases, it is possible to foretell the approach of a seizure, to ascertain its point of origin in the brain, to follow its spread or even to make a diagnosis of epilepsy in the absence of subjective symptoms or disturbances of behavior.

The electrical fluctuations that can normally be led off the brain are, during a seizure, greatly modified. The type of modification is characteristic for different types of seizure, the difference being particularly marked between grand mal and petit mal. We now have records on 50 cases of petit mal epilepsy, all of which show a wave formation that is pathognomonic for this condition. The formation appears as a large slow wave followed by a fast spike, repeating itself about three times a second. This three-a-second wave and spike occur sometimes without a petit mal attack, but, in such instances, the voltage is relatively low and only one or two waves appear. These we have called "larval" or "subthreshold seizures". From such seizures, which do not manifest themselves symptomatically and occur rather frequently in some patients, one can make a diagnosis of petit mal epilepsy without having seen a clinically obvious seizure. Various parts of the cortex show characteristic modifications of this three-a-second pattern.

Grand mal seizures are characterized by high voltage waves with a frequency of seven to twenty per second. As the seizure enters the clonic phase, the fast waves are usually grouped together into slower ones, which tend to be synchronous with the clonic movements. After a severe grand mal, there is a marked decrease in the electrical activity of the brain, so much so that the record appears flat. This period of flatness corresponds closely to the period of postseizure stupor. By taking numerous simultaneous records from different parts of the head it is possible to detect the place of onset of a Jacksonian seizure. In some cases we have discovered what appeared to be a localized starting point when the seizure itself did not suggest one. It is our hope that, if the place of origin of a patient's seizures can be found, it can be eliminated as a source of pathologic activity by the intervention of the surgeon or roentgenologist. This is still only a hope.

Another hope, which seemed worth pursuing, though not of much primary importance, was that of predicting when a patient would have a grand mal seizure. We felt that if we could do this we would deprive epilepsy of its chief horror for those that have infrequent seizures. We have realized this hope in the first case in which we have taken daily fifteen minute records. The changes that occur in this patient's record twenty-four hours before a seizure have

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afforded reliable warning of an impending seizure so that, on the basis of our predictions, she can adjust her schedule to avoid having a seizure in the street or at a social function. There is, of course, the possibility that the dose of some anticonvulsant drug could be varied according to the indications of the record and seizures prevented or much better controlled than with present methods of chemotherapy. Up to now we have not attempted this because we wished first to ascertain definitely whether seizures are predictable.

## THE CEREBRAL CIRCULATION*

BY STANLEY COBB, M.D.,† AND HENRY S. FORBES, M.D.†

THOSE of you who heard Professor Adrian speak last Monday will remember his remarkable summary of the form and function of the brain, and his emphasis on the fact that the brain was the most specialized of all our organs and the most easily injured. Among the commonest ills that may affect our brains are those that have to do with the circulation. Hence for students of medicine a knowledge of the cerebral circulation is of great practical importance.

Our human bodies are composed of cells, specialized into organs and joined into an organic whole by two main integrating systems—the blood stream and the nerves. These two reach every part of every living organ. Thus the neurologists and the students of circulation are, in a sense, not specialists for they must have knowledge of *all* the organs and their relations.

Between the two principal integrators there is a reciprocal relation that is of great importance.[1] The brain, like every other organ, is dependent upon its blood supply, but the blood supply is dependent upon a normally functioning brain, for blood flow to the various organs is largely regulated by the vasomotor centers of the brain and spinal cord. The central nervous system contains the head ganglia of the autonomic nervous system, which in turn control the vegetative nerves to the heart and vessels. Thus, failure in circulation, and failure in the nervous control of circulation are equally fatal. Stabbing the heart and pithing the medulla are equally lethal. The circulation of the brain stem is a most important mechanism for the sustaining of life; but the circulation to the cerebrum supports what to many of us is more important than life—intellect. No wonder the brain is encased in a thick skull and protected in many ways.

The safeguards to the cerebral circulation may be divided into two groups:

(a) anatomic
(b) physiologic

The *anatomy* of the blood supply to the human brain is unlike the blood supply to any other organ. The main arterial supply, coming through the vertebral and the internal carotid arteries, enters the circle of Willis and thus is distributed to all six cerebral trunks. The sharp bend of the internal carotid about the body of the sphenoid serves to moderate slightly the more violent fluctuations of pressure, such as may occur in aortic disease with hypertension. The circle of Willis is a protective mechanism of greatest importance, insuring cerebral blood supply to both hemispheres even if one carotid artery be occluded; moreover, there are anastomoses between the branches of the posterior, middle and anterior cerebral arteries, and even between the cerebral branches of the two hemispheres.[2] After leaving the circle of Willis the six great trunks to the hemispheres divide into branches that supply basal ganglia, the choroid plexus and, to a certain extent, the deep white matter. Most of the branches, however, soon reach the surface of the cortex and spread out in the piarachnoid. These send innumerable perforating arterioles directly downward into the cortex (fig. 1), where they become smaller as they branch until they finally enter the capillary bed. The arterioles and capillaries form a continuous network with branches from other arterial trunks; they meet and join with the branches of the few deep arteries which come up through the white matter and basal ganglia.

Blood from the venous limbs of the capillaries flows into the venules and drains outward to the cortex again, to be collected by the surface veins and emptied into the dural sinuses. These sinuses have no valves, so they join to make up an open system of blood channels, emptying outward largely through the jugular bulbs. The sinuses themselves are less compressible than other veins because of the tough structure of the dura, their triangular shape and the guying effect of the dura on the sinus walls tending to keep them open against pressure. The veins that drain the blood from the brain are less regular in distribution and have even more anastomoses than the arteries. In watching the living circulation of the pia through a window one may occasionally see the blood flow in an anastomotic venule reverse its direction for a few seconds and then turn back to continue as before, but one never sees the closing and opening of minute vessels as in most organs. Remarkable here are the constancy of capillary caliber and the steadiness of the flow. The veins

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can be roughly divided into two systems, the surface veins over the cerebral hemisphere, flowing into the sinuses, and the deep veins from the ventricle, choroid plexus and basal ganglia, which empty into the veins of Galen and thence out to the jugular bulb.

There are no "end arteries" in the brains of higher mammals. This has been proved by the study of injected specimens, which show that the capillary bed of the whole cortex is an endless network, in which a red cell might start in the olfactory bulb and travel to the occipital lobe. Moreover, there are many anastomoses between the arterioles and between the venules. This does not mean that the main anatomic divisions of the brain do not receive their blood supply largely from one artery; they do, but there is much overlapping of supply at the edges of these regions.

As one would expect, the blood supply to the gray matter is much richer than that to the white. The capillary network about nerve cells is dense, whereas the mesh in the white matter is much larger and more rectangular (fig. 1). Capillary counts in these tissues show that there are about 1,000 millimeters of capillary length per cubic millimeter of tissue in the middle layers of the cortex, as compared with about 200 millimeters of capillary per cubic millimeter in the underlying white matter.

The perivascular space[4] is a structure of much pathological importance; it is peculiar to the brain and cord, taking the place of a lymphatic system, for there are no lymphatic vessels in the central nervous system. The perivascular space may be looked upon as a loosened adventitial coat, surrounding all vessels and irrigated by intercellular fluid. Between nerve cells in the gray matter there are capillaries that supply nutriment to the active nerve cells; both the capillaries and neurons lie in a loose meshwork of glia fibrils filled with fluid. One speaks of "perineuronal spaces" and "pericapillary spaces"; probably they are coalescent and really indistinguishable. Together they give to both capillary and nerve cell a fluid environment where metabolic exchange can take place. There is little flow of this fluid, it is like water in a swamp obstructed by vegetation, but as the fluid reaches the vicinity of venules and arterioles it is confined in somewhat more distinct walls. These are the piaglial membrane, externally, and the inner layer of the vascular adventitial layer, internally. Around small vessels these walls are loose and incomplete, but as the flow proceeds downstream and as the vessels become larger, the walls of the perivascular space become more and more definite, until the fluid, having left the perineuronal "swamp", now flows in a stream between banks, to empty into the "lake" of the subarachnoid space. Here the fluid forms a waterjacket for the brain. It has a slow circulation; much of the fluid formed by the choroid plexus of the ventricles flows out from the fourth ventricle and is absorbed largely by the arachnoid villi, which are buds of arachnoid tissue extending into the lumina of the larger dural veins, especially the sagittal sinus.

The *physiologic safeguards* are mechanisms that tend to lessen excessive fluctuations of blood flow, thus insuring the nervous tissues against failure of oxygen supply in emergencies and against harmful congestion or sudden rises in intravascular pressure.

The rate of blood flow through the brain is determined chiefly by the level of the systemic arterial pressure. The latter, varying with the action of the heart, the venous return and the peripheral resistance, is, in turn, safeguarded against dangerous extremes by reflex control from such structures as vasoconstrictor and dilator centers, the carotid sinuses and the vagodepressor nerves.

A second factor, which to a less extent affects the cerebral blood flow, is the ability of the arteries supplying the cortex to change their caliber independently of changes in level of the blood pressure. The strongest influence causing such change in caliber is chemical—carbon dioxide, for example, dilates these vessels in the presence of either a rise or a fall in blood pressure. A much weaker influence on vessel caliber is exerted by nerve impulses through innervation from the cervical sympathetic chain. Arterial constriction by this means seems to be a minor affair and, as Schmidt[5] has shown, affects the flow unequally in different parts of the brain—the cortex most, the basal ganglia less and the medulla apparently not at all. A further safety device has been found whereby a dangerously low blood pressure will cause dilatation of arteries in the pia and partially offset the retarded blood flow.[6] In addition to these means of regulation recent investigations show that vasodilator nerves reach these vessels from the medulla via the facial and superficial petrosal nerves.[7, 8, 9]

Lennox[10] has investigated the blood flow through the brain by various methods. He found a low but rather constant oxygen saturation in blood leaving the brain; in the venous blood of the extremities the average saturation was higher, and the determinations gave more scattered results. These data indicate, first, that blood flow is more stable through the brain than through the extremities and, secondly, that the brain has either a relatively high oxygen consumption or a slow blood flow. Experiments by Wolff and Blumgart[11] actually measured blood flow through the brain and found it to be rapid, but they made only a few determinations and no corroborative work has been done. Observa-

FIGURE 1

A diagrammatic representation of one gyrus, magnified about 9 times. On the pial surface and in the arachnoid space are seen arteries and veins entering the cortical tissue where they spread out into an anastomosing capillary network, richest about the nerve cells, joining somewhat with the deep vessels of the white matter.

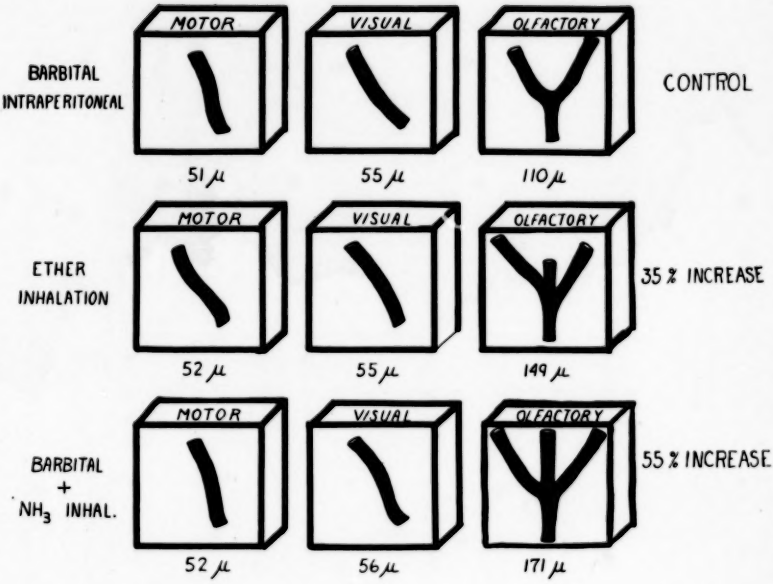


FIGURE 2

The cubes each represent 100,000 cubic micra of brain tissue. The length of open capillary in each is indicated by the number underneath the cube. It is obvious that after ether inhalation, there are more open capillaries in the olfactory bulb than there are in the controls, and that, after inhaling ammonia, there is even more marked increase in the length of open capillaries in the olfactory bulb. This change does not occur in the motor and visual areas of the cortex.

tions by microcalorimetry show that metabolism in the brain is relatively high. The constant temperature of the brain, the "closed-box" arrangement, the mixture of blood by anastomosis, the governing action of carbon dioxide, the moderating reflexes from vagodepressor nerves and carotid sinus, and the paucity of direct vasomotor control, all tend to make the cerebral blood flow constant. The fact that it does not fluctuate much under physiologic conditions may be explained teleologically by assuming that delicate nerve tissue requires a steady oxygen supply rather than a high one. This supposition is reasonable because there is evidence that a rapid change in the environment of nerve cells is more harmful than a slow but more extensive change. It would seem, then, that a constant oxygen supply to the brain is more important than an exceptionally rich one. Moreover, the brain is an organ that is at work all through life; there is no such fluctuation of load as there is in the skeletal muscles; the situation is more like that in the heart muscle.

Although the brain as a whole seems to have a steady blood supply, the cerebral hemispheres seem to have a locally variable blood supply, changing in accordance with regional activity. The evidence for this is as yet incomplete. In 1927 Cobb and Talbott[3] showed that rabbits whose nasal olfactory mucosae were stimulated strongly just at the time of sudden death had more open capillaries in their olfactory bulbs than control animals not so stimulated (fig. 2). Moreover, the increase in capillary bed was confined to the olfactory bulb and was not present in other parts of the brain. The next year Fulton[12] observed a patient of Dr. Cushing's that had a hemangioma of the occipital lobe of one cerebral hemisphere. When this man made an effort to read small print or to read in poor light, the bruit, which could be steadily heard over the occiput, increased in intensity. Other forms of cerebral activity did not seem to increase the bruit. Not until 1935 was any more evidence forthcoming to show that changing cerebral activity caused regional changes in blood flow. Then two laboratories independently observed that a local increase in temperature occurred in the cerebral hemispheres when local function was increased.

Gerard and Serota[13] in Chicago observed that when the eyes are illuminated, for periods up to one minute, a thermocouple in the optic pathways records a temperature rise beginning within a minute, increasing for about two more and returning to the original figure in another four. The average increase is roughly 0.01°C. Pinching, stroking or massaging the feet is without effect when the thermocouple is in the visual area, but leads to similar thermal changes when the thermocouple is in the cutaneous paths. These observations indicate that the regional blood flow is increased, although increased heat production by active neurons may also contribute. The mechanism involved in this increase in flow may be a localized vasodilation due to local increase in carbon-dioxide formation.

Feitelberg and Lampl,[14] performing somewhat similar experiments in Germany, found a local increase in heat production in the cerebral motor region when a cat was disturbed and caused to move, and a local increase in the visual region when a bright light shone into the eyes.

One might postulate, then, that the brain as a whole has a steady blood flow. Being active at all times throughout life the lower centers in the brain stem need an even, continuous flow upon which vital functions depend. The cerebral hemispheres, however, being more specialized and less continuously active, have a less steady blood flow, and the part of the cerebral cortex most actively functioning has a temporary and local increase in blood flow.

## SUMMARY

A constant supply of blood to the brain is vital to the life of any vertebrate, in man 20 seconds of anoxemia having harmful effects. The constancy of the blood flow is safeguarded by:

(a) Anatomical arrangements, such as the "closed box" of the skull, angulations and branching of the large arteries, and anastomosis of many cerebral vessels.

(b) Physiologic mechanisms. The blood flow is controlled first, and chiefly, through the systemic arterial pressure, which in turn has its own reflex controls. Secondly, and to a less extent, there is control by an intrinsic cerebral regulation, which causes the arteries to change caliber independently of the blood pressure. These changes in caliber are caused chiefly by chemical substances. To a much less extent sympathetic innervation controls the caliber of the vessels by feeble vasoconstriction. The existence also of vasodilator innervation through the facial nerve seems to be no longer in doubt.

Although the blood supply to the brain as a whole appears to be remarkably constant, especially that to the brain stem, there is evidence that the blood supply to the cerebral cortex may vary locally according to the regional needs from minute to minute, that is, areas concerned with a particular function when locally active have a greater blood supply.

## REFERENCES

1. Cobb, S.: The cerebral circulation. Cerebral anemia—a discussion of the mechanism and a case report. Am. J. Psychiat. **13**:947 (March) 1934.
2. Fay, T.: Cerebral-vasculature; preliminary report of study by means of roentgen ray. J. A. M. A. **94**:1727 (June 6) 1925.
3. Cobb, S., and Talbott, J. H.: Studies in cerebral circulation; quantitative study of cerebral capillaries. Tr. A. Am. Physicians **42**:255, 1927.
4. Penfield, W.: Cytology and Cellular Pathology of the Nervous System. New York: Paul B. Hoeber, p. 597, 1932.
5. Schmidt, C. F.: Intrinsic regulation of circulation in parietal cortex of cat. Am. J. Physiol. **114**:572 (Feb.) 1936.

6. Forbes, H. S., Nason, G. I., and Wortman, R. C.: Cerebral circulation: vasodilation in the pia following stimulation of vagus, depressor and carotid sinus nerves. Arch. Neurol. & Psychiat. (In press.)
7. Cobb, S., and Finesinger, J. E.: Cerebral circulation: the vagal pathway of the vasodilator impulses. Arch. Neurol. & Psychiat. 28:1243 (Dec.) 1932.
8. Chorobski, J., and Penfield, W.: Cerebral vasodilator nerves and their pathway from the medulla oblongata; with observations on the pial and intracerebral vascular plexus. Arch. Neurol. & Psychiat. 28:1257 (Dec.) 1932.
9. Forbes, H. S., Cobb, S., Nason, G. I., and Wortman, R. C.: (Unpublished.)
10. Lennox, W. G.: Constancy of cerebral blood flow. Arch. Neurol. & Psychiat. 36:375 (Aug.) 1936.
11. Wolff, H. G., and Blumgart, H. L.: Cerebral circulation; effect of normal and of increased intracranial cerebrospinal fluid pressure on velocity of intracranial blood flow. Arch. Neurol. & Psychiat. 21:795 (April) 1929.
12. Fulton, J. F.: Observations upon vascularity of human occipital lobe during visual activity. Brain 51:310 (Oct.) 1928.
13. Gerard, R. W., and Serota, H.: Localized thermal changes in the brain. Proc. Am. Phys. Soc., p. 59, 1936.
14. Feitelberg, S., and Lampl, H.: Methode zur Messung der Wärmetönung an der Grosshirnrinde. Arch. f. exper. Path. u. Pharmakol. 177:609, 1935.

# SYNCOPE AND COLLAPSE*

## ABSTRACT

BY SOMA WEISS, M.D.†

THE physiologic activity of the circulation depends on the integrity of numerous regulatory functions. The nature of these functions is mainly nervous or chemical, although often the two types cannot be rigidly separated. Many of these regulatory functions are submerged in normal bodily states, and their role becomes detectable only in stress, under experimental conditions and in disease.

Syncope and circulatory collapse represent abnormal bodily states, in which the relations between the heart, the vascular system and the nervous system are seriously disturbed. The study of the pathogenesis of these conditions allows an insight into the integral activities of these systems, and also into the mechanism of unconsciousness and convulsions and of the adjustment to the orthostatic position of the body.

Both syncope and collapse occur in health as well as in disease. In normal persons they usually represent transient and benign phenomena. In disease, on the other hand, they may be attended with slow recovery and may terminate fatally.

A study of syncope has brought to light several mechanisms that are responsible for the attacks. It has been possible to distinguish several types. Examples are found of types in which hypoactivity or hyperactivity of normal reflexes is the primary factor (carotid sinus, vasovagal, vagovagal, oculocardiac and aortic depressor reflexes).

The fundamental characteristics of the pathogenesis of syncope are a sudden, temporary slowing or cessation of the circulation and the resulting ischemia of the central nervous system, which promptly leads to unconsciousness and convulsive seizures. In the mechanisms of unconsciousness anoxemia is but one factor. The rate of the change in the cerebral circulation rather than the absolute degree of anoxemia, together with nerve impulses from certain vascular areas, usually set up by a fall in the arterial pressure, appears to be the main factor in the causation of unconsciousness and of convulsions associated with syncope.

The characteristics of the circulation and the state of the nervous system in syncope and in collapse have been determined, and it has been found that the primary difference between the two states is in the time element. The collapse induced by nitrite and "gravity collapse" following exercise may be cited as examples. The state of the central nervous system in collapse depends on changes in vasomotor reflexes and in the medullary centers, which are activated partly by a fall in the arterial pressure and partly by cerebral anoxemia. In the emergency of collapse, simultaneous overactivity of sympathetic and parasympathetic functions occurs.

**For detailed clinical and experimental data and discussion, the following articles by the author may be consulted:**

Weiss, Soma and Baker, T. P.: The carotid sinus reflex in health and disease; its rôle in the causation of fainting and convulsions. Medicine 12:297 (Sept.) 1933.
Weiss, Soma; Ferris, E. B., Jr. and Capps, R. B.: The influence of reflexes in the induction of intracardiac disturbances. Tr. A. Am. Phys. 49:177, 1934.
Weiss, Soma and Ferris, E. B., Jr.: Adams-Stokes syndrome with transient complete heart block of vagovagal reflex origin; mechanism and treatment. Arch. Int. Med. 54:931 (Dec.) 1934.
Weiss, Soma: Syncope and related syndromes. Oxford Medicine 2:250 (9) 1935.
Ferris, E. B., Jr.; Capps, R. B. and Weiss, Soma: Carotid sinus syncope and its bearing on the mechanism of the unconscious state and convulsions. Medicine 14:377 (Dec.) 1935.
Weiss, Soma; Capps, R. B.; Ferris, E. B., Jr. and Munro, D.: Syncope and convulsions due to a hyperactive carotid sinus reflex; diagnosis and treatment. Arch. Int. Med. 58:497 (Sept.) 1936.
Weiss, Soma; Wilkins, R. W. and Haynes, F. W.: The nature of circulatory collapse induced by sodium nitrite. J. Clin. Investigation 16:73 (Jan.) 1937.
Wilkins, R. W.; Haynes, F. W. and Weiss, Soma: The rôle of the venous system in circulatory collapse induced by sodium nitrite. J. Clin. Investigation 16:85 (Jan.) 1937.
Weiss, Soma and Wilkins, R. W.: Syncope, collapse and shock; their medical significance and their treatment. M. Clin North America. (In press.)

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# VENOUS THROMBOSIS AS THE PRIMARY ALTERATION IN THE LESIONS OF "ENCEPHALOMYELITIS" AND MULTIPLE SCLEROSIS*

ABSTRACT

BY TRACY J. PUTNAM, M.D.†

THE experimental production in animals of venular thrombi scattered throughout the body has been reported by Kusama[1] and others following the administration of a great variety of substances, including serum, bacterial products and extracts of organs. Similar thrombi are often found at autopsy in human beings dying of various conditions, especially of acute infections. In most organs of the body such thrombi may dissolve or become organized without leaving permanent damage behind.

The occurrence of such thrombi in the brain has been demonstrated experimentally by Hoefer[2] at the Neurological Unit of the Boston City Hospital. There is no reason to suppose that the nervous system in human beings is exempt from thrombosis in conditions that predispose to it. The histologic result of venular obstruction in the brain has been studied experimentally,[3] and in human pathologic material.[4] Lesions are more apt to occur in the white matter than in the gray. They consist of small foci of degeneration, often rather mild, which affects the myelin more than the cells or axis cylinders. Axis cylinders may, indeed, be left essentially intact. In the acute stage of the process there is a diffuse perivascular glial reaction. In a later stage a dense scar of fibrous glia forms.

This histologic picture in the acute stage is characteristic of the "postinfectious encephalomyelitis" that has been reported occasionally following vaccinia, measles, antirabic inoculation and other diseases. In such encephalitides widespread congestion and thromboses are present through the central nervous system, occasionally unaccompanied by any but the mildest signs of inflammation. Records of the state of the blood vessels in other organs are scanty, but in one case observed in this laboratory, thrombi were found in the liver, heart and lungs. It has long since been suggested (by Van Bogaert[5] and others) that the "postinfectious encephalitides" are allergic phenomena, on the grounds that the onset of cerebral symptoms coincides exactly with the development of complete immunity. There is reason for believing, therefore, that the morphologic expression of the allergic state in this instance is the occurrence of a widespread thrombosis.

The end result of an area of myelin degeneration following venular obstruction in the central nervous system is a glial scar, through which some axis cylinders may run. Small neighboring areas tend to coalesce, and their borders grow more definite as time goes on. This process is recognized in human pathology as the sclerotic plaque of multiple sclerosis. There is evidence for believing that such plaques go through a stage in which they resemble the lesions of "encephalomyelitis",[6] and evidences of vascular occlusion—engorgement and tortuosity of vessels, perivascular accumulation of blood pigment, thrombosis, endothelial proliferation and fibrous closure—are regularly found in them.[7]

This conception of the origin of the lesions of multiple sclerosis, which has slowly grown from the studies carried on at the Neurological Unit over the past seven years, has recently received support from two unexpected sources. In the first place, Alexander and Myerson,[8] using the method of microincineration, have shown that an increase of minerals is the rule in inflammatory lesions, while a decrease regularly occurs in necroses due to anoxemia and in the plaques of multiple sclerosis.

In the second place, this conception has even more lately become reconciled with the results of Steiner's long labors. Steiner[9] has shown that a certain type of cell-containing granules that impregnate with silver under well-defined conditions ("Silberzellen") is characteristic of the lesions of multiple sclerosis and of dementia paralytica. For this reason, and because similarly stained structures may be found arranged in wavy lines, he has suggested that they represent fragments of spirochetes. Blackman[10] working at the Neurological Unit, has succeeded in demonstrating similar "silver cells" in three cases of venous thrombosis of arteriosclerotic origin, in which the presence of any infection appears extremely unlikely. This leaves the way open to the explanation that the silver-stained granules represent phagocytized debris, perhaps hemoglobin, which produces a heavy silver precipitate. Vascular obstruction and accumulation of blood pigment are common phenomena in dementia paralytica.[11]

If the exacerbations of multiple sclerosis are considered to be due to the formation of successive crops of small thrombi, we should expect them to be influenced by certain external factors.

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REFERENCES

1. Kusama, S.: Ueber Aufbau und Entstehung der toxischen Thrombose und deren Bedeutung. Beitr. z. path. Anat. u. z. allg. Path. 55:459, 1913.
2. Hoefer, P.: Personal communication.
3. Putnam, T. J.: "Encephalitis" and sclerotic plaques produced by venular obstruction. Arch. Neurol. & Psychiat. 33:929 (May) 1935.
4. Alexander, L., and Putnam, T. J.: Cerebral lesions due to vascular occlusion. (To be published.)
5. Van Bogaert, L.: Essai d'interprétation des manifestations nerveuses observés au cours de la vaccination, de la maladie sérique et des maladies éruptives. Rev. neurol. 2:1 (July) 1932.
6. Putnam, T. J.: Studies in multiple sclerosis; similarities between some forms of "encephalomyelitis" and multiple sclerosis. Arch. Neurol. & Psychiat. 35:1289 (June) 1936.
7. Putnam, T. J.: Evidences of vascular occlusion in multiple sclerosis and "encephalomyelitis". Arch. Neurol. & Psychiat. (In press.)
8. Alexander, L., and Myerson, A.: The mineral content of various cerebral lesions as demonstrated by the micro-incineration method. Arch. Neurol. & Psychiat. (To be published.)
9. Steiner, G.: Krankheitserreger und Gewebsbefund bei multipler Sklerose. Berlin: Julius Springer, 1931.
10. Blackman, N., and Putnam, T. J.: The nature of the "silver cells" occurring in multiple sclerosis and other conditions. Tr. Boston Soc. Psych. & Neurol. (To be published in Arch. Neurol. & Psychiat.)
11. Merritt, H. H.; Putnam, T. J., and Campbell, A. C. P.: The pathogenesis of the cortical atrophy of dementia paralytica. Arch. Neurol. & Psychiat. (To be published.)

# A CONSIDERATION OF "RHYTHM" AS A MEASURE FOR BIRTH CONTROL

BY THOMAS R. GOETHALS, M.D.*

MUCH light has been shed, in recent years, upon reproductive physiology. Cyclic changes in the genital tracts of female rodents, as described by Stockard and Papanicolaou,[27] Long and Evans,[16] Allen[1] and others, yielded the original basis for biologic determination, control and assay of the earliest identified reproductive hormones. Knowledge of the correlated changes in the gonads of female test animals has since led to an understanding of the significance of estrus and heat in relation to ovulation. The work of Hartman[7] and his collaborators has clarified the physiology of menstruation in the monkey and, by analogy, has led to a clearer conception of the relation between human ovulation and menstruation. Thus the laboratory has succeeded in explaining a phase of physiology that has been long used clinically by veterinarians and animal breeders, and suggests the application of our present knowledge to human reproductive problems.

The theory of phases of physiologic fertility and sterility within the menstrual cycle is by no means new, and its origin will not be considered here. That such a theory is of fundamental importance in the life of many married couples, however, is unquestionable, and the scope of this article is to examine and discuss the available evidence in its favor.

Records of medical history indicate that gynecologists and obstetricians have for years expressed the belief that conception may occur at any time during the menstrual cycle. Dickinson,[4] writing in 1925 on the subject of the "safe period" as a birth control measure, states that conception has occurred at any time of the month in some women. Williams,[29] in the last edition of his textbook in 1930, implies that conception may occur at any time in the month, though it was then generally believed that it was most usual somewhere about the middle of the intermenstrual period. Fraenkel[5] stated in 1930, "There is no period within the cycle when conception can be said to be certain."

The opinions of the authorities quoted above are based upon several clinical and physiologic observations, a few of which are enumerated[30]:

1. Records of pregnancies resulting from isolated coitus. Zangemeister, Pryll and Siegel, compiling data from over 100 such cases occurring in Germany during furloughs of soldiers from the army in the course of the World War, agree that:
   a. Conception can occur at any time during the month.
   b. A marked difference exists between favorable and unfavorable periods.
   c. Conception is most likely in the week or 10 days after menstruation.
   d. The week preceding menstruation is the period of least likelihood of conception, averaging about 7 per cent.
   e. Conception during menstruation is relatively frequent, about 13 per cent.

2. Records of human ovulation, as studied in the course of laparotomies, by Fraenkel, Tschirdewahn, Schroeder, Ruge and others. These authors placed the date of ovulation variously as from the eighth to the twenty-first day of the menstrual cycle. Their findings, however, were denied by other gynecologists.

3. The possibility that human ovulation might be induced by coital stimulus, a phenomenon that occurs regularly in the cat, rabbit and ferret.

4. The fertility of orthodox Jewesses, who must not cohabit before the eleventh day of the cycle.

5. The possibility that sperm cells may remain viable for a considerable time within the fallopian tube following insemination and may thus fertilize the ovum days after intercourse.

Opposed to these views was that propounded by Capellmann,[2] who stated, "Women are apt to be fertile during the first 14 days after men-

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struation and 3 to 4 days before the next." Latz,[13] in 1906, wrote in his "Manual of Health for Women," "It is well known that the greatest probability of conception obtains where intercourse follows immediately upon the cessation of the menses. Later this probability decreases from day to day until finally there is a time when conception becomes improbable. According to the best experience, this time is the third week after the beginning of menstruation."

Comparing these points of view one is left with the impression that the weight of opinion is preponderatingly favorable to the belief that conception may occur at any time during the menstrual cycle. Quite recently, however, a very vocal school of thought has come into being, which is based upon the independent work of the Japanese surgeon, Ogino, and the Austrian investigator, Knaus. It will be the purpose of this paper to analyze their contributions.

Ogino,[22] a gynecologist of Niigata, Japan, who had previously published his conclusions in Japanese medical journals, first appeared in Occidental circles in 1930 with the publication of an article in the *Zentralblatt für Gynäkologie*, entitled "The time of ovulation and the time of conception." In this article he reviews the work done by Fraenkel and others in determining the time of ovulation in the human menstrual cycle, and reports similar observations made by himself, with the important distinction that he records the time of ovulation with reference to the next succeeding menstruation rather than to that preceding the laparotomy at which the observation was made. He reports the findings in 81 women whose menstrual cycles were regular, according to him, and by arranging them in tabular form he is able to state that in no case was an unruptured follicle found later than the twelfth day before the next catamenia was due and that in no case was a ruptured follicle or a corpus luteum found previous to the sixteenth day before the next period was due. From this he concludes that ovulation occurs at earliest on the sixteenth day before and at latest on the twelfth day before the onset of the next ensuing menstruation. Finally, in reviewing the work of the German authors that have been previously quoted, he was able to satisfy himself, by utilizing the concept of ovulation preceding menstruation by a specified time rather than by succeeding it by a definite interval, that in 557 of the cases reported by them only 15 did not fall within the limits of the time of ovulation as described by him.

Ogino's conclusions regarding the time of ovulation are as follows:

1. The time of ovulation occurs during the 5 day period that lies between the twelfth and sixteenth days (both inclusive) before the next menstruation; in other words, menstruation begins, if no conception occurs, on the thirteenth to the seventeenth day following ovulation.

2. The time of ovulation is independent both of the length of the menstrual cycle and of irregularity of the menstrual cycle, save that

   a. Destruction of the corpus luteum in the stage of development by medicinal or pathologic processes can result in a premature menstruation, and that

   b. The endometrium may be pathologically refractory to the corpus luteum hormone, so that menstruation does not occur, despite a previous ovulation.

According to Ogino the question of the time of conception can be answered, if we know:

1. The time of ovulation. This question, he feels, has been answered by his work.

2. The life of spermatozoa in the female genital tract. He quotes the opinions of Hoehne and Behne and others to show that spermatozoa live generally 3 days, exceptionally 4 to 8 days, in the female genitalia after ejaculation.

3. The length of time during which the ovum can be fertilized after extrusion from the graafian follicle. To this question the author has no definite answer, but believes that the ovum can be fertilized only for a few hours after its journey down the tube has commenced.

Summing up his observations and his theories, Ogino postulates that conception can take place only from intercourse during the 3 days before the time of ovulation or during the time itself; exceptionally, he admits, it may occur from coitus 4 to 8 days before this time.

In final conclusion he states:

1. The time of conception usually lies within the 8 day period between the nineteenth and the twelfth days before the next menstruation.

2. Conception is seldom possible within the interval from the twenty-fourth to the twentieth day before the next menstruation.

3. Conception is impossible from the eleventh to the first day before the next menstruation.

Knaus,[8] of Graz, writing in the *Münchener medizinische Wochenschrift* in 1929, independently of Ogino, flatly contradicts the opinion that a mature woman can conceive at any time during the menstrual cycle. He quotes work done by Heape, Hammond and others to show that the rabbit ovum degenerates rapidly unless fertilized within 2 hours of follicle rupture, and the work of Hammond and Asdell to show that rabbit spermatozoa lose their power of fertilization in 32 hours after being deposited. From this he postulates that the human female can be

fertilized only at or very near the time of ovulation. The question, according to him, is to determine this time. For this purpose he has resorted to laboratory experimentation, which has shown that the uterus of the rabbit is refractory to stimulation by posterior pituitary extract, pituitrin, when under the influence of the corpus luteum of real or pseudopregnancy. Applying this test to 36 women with regular menstrual cycles, he has found that the uterus reacts to pituitary extract during the first half of the cycle, whereas it is refractory during the second half. This change in reaction occurs on the sixteenth to the eighteenth day of the cycle, from which Knaus concludes that ovulation has preceded the change by not over 48 hours, that is, on the fourteenth to the sixteenth day. He therefore believes that conception is impossible after the eighteenth day of the cycle.

As to the earlier limit of the ability to conceive, Knaus discounts any functional activity of sperm cells in the female genital organs for more than 48 hours, and hence does not believe that sperm can lie in wait for the ovum for longer than that period. He concludes, "The fruitful period during which coitus can result in pregnancy, in normal women with a 4 weeks' cycle, begins with the eleventh day and ends with the seventeenth day of the intermenstruum; and the optimum of fertility for women lies in the interval from the fourteenth to the sixteenth day of the cycle."

We have thus reviewed the inception of the theory, propounded by Ogino and Knaus, of rhythmic fertility and sterility in the normal, mature, human female. Meanwhile evidence was accumulating more and more definitely that ovulation usually occurs at or about the middle of the menstrual cycle; the work of Pratt, Allen, Newell and Bland[24] in 1929 on human ova from the uterine tubes, that of Frank[6] and his co-workers on the female sex hormone or estrin, that of Kurzrok[12] and his collaborators on prolan A excretion, that of Meigs and Hoyt[18] on bleeding from ruptured graafian follicles as a clinical syndrome, to mention but a few, all lead to this conclusion. It would seem, at first glance, that the application of the theory of rhythmic fertility and sterility should be simple.

Unfortunately, however, the clinical application of the principles demonstrated in sex-physiology during the past 15 years has not been uniformly productive of the expected results. Too many unknown factors have been involved. This has been true in the use of the Ogino-Knaus theory. It will be recalled that the former published his clinical observations concerning women that menstruate regularly and the latter based his investigative work on a series of women with regular cycles. What of women with irregular cycles? What proportion of women are regular to the day?

Ogino[23] attacks this question in a paper published in 1932, stating that, while the time of conception is from the tenth through the seventeenth day after the onset of menstruation in women with 28-day cycles, it must be displaced forward or backward in the cycle, accordingly as this is shorter or longer than 28 days. Since most women show some irregularity in cycles, the following formula is recommended:

Beginning of time of possible conception = 10 plus (shortest cycle minus 28) days

Ending of time of conception = 17 plus (longest cycle minus 28) days.

That is, that a woman whose cycles vary from 24 to 30 days reckons her period of susceptibility to fertilization as beginning at 10 plus (24 — 28) equals 6, and ending at 17 plus (30 — 28) equals 19; in other words, beginning with a period starting February 1, she may be fertilized by coitus occurring on February 6, February 19, or at any time between.

Ogino further states that while this concept is theoretically valid for all women, it is practically of value only for women whose cycles vary 10 days or less. Finally, he states that he does not claim for his theory absolute safety in the control of conception.

Knaus, whose writings on the subject have been prolific, comes to our attention again in 1933[9] and 1934,[10] when he lays down the following postulates:

1. The ovum can be fertilized only for a few hours after ovulation.
2. The spermatozoa of all mammals that have scrotal testicles lose their power of fertilization within the female genital tract within 48 hours.
3. The corpus luteum of menstruation in the human race has an independent function of 14 days, regularly. A second ovulation is impossible during this time, because of inhibition by the existing corpus luteum.
4. Rupture of the follicle occurs regularly on the fifteenth day before the onset of the next menstruation, regardless of the length of the cycle.
5. The impulse for the continuance of the corpus luteum longer than the normal is supplied by the hormones of the implanted egg.

As a matter of practical utilization of his theory, Knaus insists that all women be instructed to keep accurate, written data regarding their menstrual intervals for at least a year before they can expect to rely upon it for control of conception. The longest and the shortest cycles should be charted during this time, and the periods of ovulation should be recorded as from the fifteenth day before the end of the shortest cycle to the fifteenth day before the

end of the longest cycle. Three days are added before the earliest ovulation, in order to cover amply the fertilizing ability of the sperm, and 1 day after the latest ovulation, in order to cover amply the fecundity of the ovum. Save during the days thus plotted, conception will not occur. Thus, in a cycle of 24 to 30 days

Ovulation occurs on the tenth to the sixteenth day from the beginning of the last menstruation.

Conception may occur from the seventh to the seventeenth day from the beginning of the last menstruation.

Thus it is evident that Ogino and Knaus reach conclusions concerning natural conception control that are almost identical, save that the latter places the period of fecundity within limits which are narrower by 3 days.

The clinical evidences in support and in contradiction of the theories of Ogino and Knaus have come from various sources during the past several years, but are not yet sufficiently numerous or well-documented to warrant definite conclusions. These will now be considered.

In 1930, Ogino[22] reports the following in support of his theory:

1. Nine cases of pregnancy where the date of fruitful intercourse was absolutely known:
   a. In 8 the day of conception lay within the time of ovulation or in the 3 days preceding; in 1 conception occurred on the fourth day preceding the time of ovulation.
   b. Cohabitations after the time of ovulation were always sterile, even though carried on for months and years.
2. In 11 cases where the dates of marriage were known, Ogino found
   a. When marriage takes place before or during the time of ovulation, as reckoned for the bride, there exists for her the possibility of becoming pregnant without a succeeding menstruation.
   b. When marriage takes place after the time of ovulation, the woman will menstruate at least once thereafter.

In 1932, the same author[23] reports the following:

1. Five more cases of pregnancy dating from isolated intercourse during the time of conception.
2. Two fruitful matings over a period of 30 months, in which thirty cohabitations between the sixth and tenth days before the time of ovulation were sterile.

Knaus,[9] in 1933, gives a table showing the cycles of a 22 year old woman for 1 year, together with her ovulations and the dates of forty-five cohabitations, all in the "safe period", as reckoned by him. No pregnancy resulted.

Miller, Schulz and Anderson,[19] in 1933, utilizing Knaus' reckoning of periodic sterility, show:

1. The menstruations and coitus of a woman for a period of ten cycles, during which she avoided pregnancy by intercourse forty-eight times during the "sterile" intervals.
2. A tabulation of the experience of 87 couples, the females of which showed twelve types of cycles, followed over periods up to 6 months. Intercourse was carried out 725 times during the reckoned "sterile" intervals without the occurrence of a single pregnancy.

Latz,[14] in his book, "The Rhythm," which appeared in October, 1932, and in subsequent issues since, has accepted the Knaus' theory in principle, but has extended the time of conception to correspond to that advocated by Ogino. In his book he states, "Well over 60,000 copies of 'The Rhythm' have been disposed of. About twenty complaints have been received that the rhythm theory 'did not work'. In all instances except two of reported failures, where cooperation was furnished, it was possible to point out that the directions laid down in 'The Rhythm' had not been followed." While the book does not yield any statistics more definite than those just quoted, the author has published an article[15] in the *Journal of the American Medical Association*, showing a graphic record of 114 women who had had intercourse according to "the rhythm" during a total of 1,128 months without the occurrence of a single pregnancy.

Macias de Torres,[17] in 1933, states that he has had no experience with the premenstrual sterility claimed by Knaus, but says that he has advised coitus during the postmenstrual phase of the cycle for 10 couples without a failure in contraception, during a period lasting from 2 to 10 years.

Smulders,[26] of Holland, has accepted Ogino's theory and has published a monograph on the subject. In fact, the Dutch literature refers to the theory of periodic fertility and sterility as the Ogino-Smulders theory.

Carvalho Azevedo,[3] in 1936, published an exhaustive review of the Ogino-Knaus theory in the Brazilian literature. He reports personal observation of 50 patients, whom he has instructed in use of "the rhythm". There were two failures in this series, which he attributes to insufficient preliminary observation of variations in their cycles.

Weinstock,[28] on the other hand, and Schumacher,[25] writing in the German literature in 1934 and 1935, respectively, attack the theory. The former reports 416 cases from the Breslau clinic, where pregnancy followed a single coitus. She tabulates her cases to show that conception is possible on every day of the cycle, with the optimum time for conception on the fifth to the

tenth day. Schumacher reports 3 cases of pregnancy resulting from coitus from 1 to 3 days before menstruation was due, explaining these mishaps by induced ovulation. Knaus,[11] on the other hand, answers these criticisms by stating that Weinstock's cases had kept record of only three cycles before the fruitful intercourse took place and that their variations were, therefore, not accurately recorded, and that Schumacher's cases, which were reported as having absolutely regular cycles, cause suspicion to be cast upon the credibility of the histories.

Meanwhile, Miller, quoted above, seems to have been the most vocal American protagonist of "the rhythm" theory that has demonstrated his results. In his latest paper,[20] published in *Clinical Medicine and Surgery*, he states, "I have now completed a careful examination of the cohabitation record of 154 couples, over a period of several months. There were over 2,200 cohabitations, both before and after the calculated fertile period, not one of which resulted in pregnancy. After using the knowledge of the fertile period successfully for several months, two of the couples cohabited just once during the fertile period. Both women became pregnant, although both used contraceptive measures." In a personal communication to the writer, dated Feb. 3, 1936, Miller says, "The figures for the past 2 years have not been published, but suffice it to say that the number of cohabitations run into the thousands. . . . At this time I am happy to say that I believe that this is a definite physiologic law of nature just as accurate as the physiologic laws concerning the pulse rate, the respiration rate, or the rate of urinary function under normal conditions. . . . I had to be shown by my own conclusions. . . ."

This seems to complete the record to date. The lay press has animadverted on the subject as well, for an article in a magazine published in 1935 stated that "Milady must now regulate her libido by the calendar", if she is to use "rhythm" successfully. To those that are interested Latz, in his book, as well as Ogino, Knaus, and Smulders, in pamphlets written by each of them, lay down the rules for applying the theory. One's attention is arrested by their explicit directions, which must be studied and mastered by the advising physician, and which, as a matter of even more importance, must be followed to the letter by couples relying on "rhythm". Of these, only those laid down by Latz will be transcribed:

1. A written record is made of the dates of the beginning of menstruation covering a period of at least 8 months to 1 year before applying the method. Patients should also record disturbing factors, which may upset the regularity of menstruation, such as sickness (even colds), mental shocks or upsets, physical change of climate or altitude.

2. There must be no kind of sexual intercourse during the time of conception.

3. A regularity in menstruation must prevail. Variations in cycles should not be more than 10 days; a larger variation makes the use of the method impractical.

4. The woman is told that her fertile period extends from the twelfth to the nineteenth day before her next expected menstruation, the expected first day of menstruation being calculated from the longest cycle of the last 8 months, plus the days of variation between the longest and the shortest cycle in the last 8 months added to the beginning of the fertile period.

The "safe period" should not be used:

1. After confinement, miscarriage, or abortion, until the regularity of the cycle is reestablished.

2. After febrile or debilitating diseases or severe physical injuries.

3. After severe psychic or emotional upsets.

4. After any drastic alteration in the ordinary routine of life, such as prolonged travel in a strange climate, and strenuous exercise. During and after these unusual happenings the method should not be used again until it is definitely established that the cycle is again normal.

From consideration of the views above expressed, both for and against the theory of rhythmic fertility and sterility, one cannot fail to be impressed by the following observations:

1. The theory cannot be applied successfully without prolonged and meticulous study of the variation in menstrual cycles of the woman in question, lasting over 8 months to a year. The average woman is casual about the exact dates of her periods, as any physician can attest; many that think they are absolutely regular actually vary from 3 to 4 or more days. In applying the rhythm theory the woman must not know "about" when her last period began or "about" when her next is due; she must know exactly when her last menstruation occurred, and within what limits her next is due to occur. Finally, she must give due cognizance to the factors mentioned by Latz, which may throw her "rhythm" off the usual cycle.

2. The shorter the woman's cycle is, the shorter is her period of physiologic sterility; in fact, assuming menstruation to last 4 days, there is no postmenstrual safe period, if her shortest cycle is 24 days or less.

3. The method may be applied with a reasonable hope of success if the woman and her

husband are mature and intelligent enough to record the necessary data accurately, and are sufficiently self-controlled to cohabit only in the free days, as worked out for the former.

4. Unless a bride-elect has kept calendar records of her periods, as advocated by Knaus and Latz, and unless her husband is instructed either by her or by her physician, one may feel pessimistic about the success of the method as applied to young newlywed couples. However, any form of contraception in such cases is apt to fail.

5. Records of cohabitation kept by couples that observe the rules of "rhythm" successfully are not conclusive as to its efficacy, unless it be demonstrated that their mating is fertile by intercourse during the fertile period.

6. Using "the rhythm" "in reverse" should be the physiologically optimum method of promoting fertility.

7. "The rhythm," intelligently applied, would appear to be the best method of avoiding conception among couples that, for religious or other reasons, are unwilling to apply other contraceptive measures.

8. The use of the method may lead to disaster in those women in the late thirties and early forties whose cycles at time begin to lengthen.

Concluding, the words of Emil Novak,[21] in an article published in 1934, may well be mentioned: "There is no doubt on *a priori* grounds that the optimal time for conception lies within the span which embraces most ovulations. This is quite different from saying that conception is absolutely impossible at other times, because

"1. The possibility of induced or coital ovulation must be borne in mind.

"2. Evidence for the exact period of survival of the spermatozoa is not yet clear.

"3. Uncertainty still exists, in women with irregular cycles, as to the part played in this irregularity by the preovulatory and postovulatory phases of the cycle."

REFERENCES

1. Allen, E.: Oestrous cycle in mouse. Am. J. Anat. 30:297 (May) 1922.
2. Calmann, C.: Pastoral Medizin, pp. 304-307, 1923.
3. Carvalho Azevedo, F. de.: Annaes Brasil. de Gyn. 1:255 (April), 386 (May), 474 (June) 1926.
4. Dickinson, R. L.: "Safe period" as birth control measure; study and evaluation of available data. Am. J. Obst. & Gynec. 14:718 (Dec.) 1927.
5. Fraenkel, L.: Sterilisierung und Konzeptionsverhütung. Arch. f. Gynäk. 144:86, 1931.
6. Frank, R. T.: The Female Sex Hormone. Springfield: Charles C Thomas, 1929.
7. Hartman, C. G.: Reproductive phenomena in monkey, Macacus rhesus. Am. J. Obst. & Gynec. 19:405 (March) 1930.
8. Knaus, H.: Ueber den Zeitpunkt der Konzeptionsfähigkeit des Weibes im Intermenstruum. München. med. Wchnschr. 70:1157 (July 12) 1929.
9. Knaus, H.: Die periodische Frucht- und Unfruchtbarkeit des Weibes. Zentralbl. f. Gynäk. 57:1393 (June 17) 1933.
10. Knaus, H.: Geburtenregelung auf natürlichem Wege. Wien. klin. Wchnschr. 47:26 (Jan. 5) 1934.
11. Knaus, H.: Zur Bestimmung des Ovulations- und Konzeptionstermines. Zentralbl. f. Gynäk. 59:2642 (Nov.) 1935.
12. Kurzrok, R.; Kirkman, I. L., and Creelman, M.: Studies relating to time of human ovulation. Am. J. Obst. & Gynec. 28:319 (Sept.) 1934.
13. Latz, P. J.: Quoted by L. J. Latz.[31]
14. Latz, L. J.: The Rhythm of Sterility and Fertility in Women. Chicago: Latz Foundation, 1935.
15. Latz, L. J.: Natural conception control. J. A. M. A. 105:1241 (Oct. 19) 1935.
16. Long, J. A., and Evans, H. M.: The oestrus cycle in the rat. Mem. Univ. Calif. 6:1, 1922.
17. Macias de Torres, E.: Les phases de stérilité physiologique de la femme. Gynéc. et obst. 27:513 (June) 1933.
18. Meigs, J. V., and Hoyt, W. F.: Rupture of graafian follicle, corpus luteum and small follicle or lutein cysts simulating appendicitis. Am. J. Obst. & Gynec. 25:532 (April) 1933.
19. Miller, A. G.; Schulz, C. H., and Anderson, D. W.: Conception period in normal adult women. Surg. Gynec. & Obst. 58:1020 (June) 1932.
20. Miller, A. G.: Progress in the study of physiologic sterility. Clin. Med. & Surg. 42:19 (Jan.) 1935.
21. Novak, E.: Two important biologic factors in fertility and sterility. Is there a "safe period"? Anovulatory menstruation as possible cause of sterility. J. A. M. A. 102:152 (Feb. 10) 1934.
22. Ogino, K.: Ovulationstermin und Konzeptionstermin. Zentralbl. f. Gynäk. 54:464 (Feb. 22) 1930.
23. Ogino, K.: Über den Konzeptionstermin des Weibes und seine Anwendung in der Praxis. Zentralbl. f. Gynäk. 56:721 (March 19) 1932.
24. Pratt, J. P.; Allen, E.; Newell, Q. U.; and Bland, L. J.: Human ova from the uterine tubes. J. A. M. A. 93:834 (Sept. 14) 1929.
25. Schumacher, P. H.: Zur Frage der periodischen Unfruchtbarkeit des Weibes. Monatsschr. f. Geb. u. Gyn. 99:64 (March) 1933.
26. Smulders, J. N. J.: Periodische Enthaltung in der Ehe. Regensburg: G. J. Manz, 1932.
27. Stockard, C. R., and Papanicolaou, G. N.: The existence of a typical oestrous cycle in the guinea-pig: with a study of its histological and physiological changes. Am. J. Anat. 22:225 (Sept.) 1917.
28. Weinstock, F.: Das zeitliche Verhalten von Ovulations- und Konzeptionstermin an Hand von 416 Fällen mit genau bekannter einmaliger Kohabitation und nachfolgender Schwangerschaft. Zentralbl. f. Gynäk. 58:2947 (Dec. 15) 1934.
29. Williams, J. W.: Text Book of Obstetrics. New York: D. Appleton & Co., 1930.
30. Quoted by Dickinson[4] and Latz[31].

# THE CONTROL OF ABORTION*

BY FRED J. TAUSSIG, M.D.†

BY a careful analysis of the total number of confinements annually in the United States, of the relative frequency of abortions to confinements, of the maternal mortality statistics of our government and various scientific compilations we are justified in concluding that (1) 600,000 to 700,000 abortions occur annually in this country; (2) 7,000 to 10,000 mothers annually lose their lives from abortion; (3) three to four times that number of women are physically handicapped each year as a result of abortion.

These figures are, of necessity, approximations rather than accurate compilations, but by a careful system of checks and counterchecks I am convinced that they are very near the actual truth.

The problem that faces us as physicians is to control this scourge so far as it is humanly possible. I realize all the difficulties attendant on the control of a condition so closely tied up

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with the inner moral lives of persons. Nevertheless it is possible for us to do a few definite things toward this end. These are the matters I want to discuss with you this evening.

Abortion may be divided into therapeutic, spontaneous and illegally induced. Concerning therapeutic abortion, comprising about 3 per cent of the total, the interruption of pregnancy for such medical reasons is rather to be sought than avoided and its control or limitation depends largely upon sterilization or contraception as a way of avoiding the harmful pregnancy.

We are primarily concerned tonight with the study of spontaneous abortions, about 30 per cent of the total, and illegally induced abortions, about 66 per cent of the total.

While in numbers spontaneous abortions present the smaller problem, we as physicians are deeply interested in these cases because they include that large group of women who crave the joys of motherhood but through untoward circumstances, in spite of repeated pregnancies, are denied its consummation.

Fundamental to any plan for the reduction in the number of spontaneous abortions is a better understanding of the underlying causes of these abortions. Unfortunately our knowledge of this subject is still very meagre. It is almost in inverse proportion to the number of theories that have been propounded by various writers. Yet it must be said that we are justified here and there in drawing conclusions and making certain definite recommendations as to preventive treatment. So far as possible the study of factors that might predispose to abortion and their correction should *precede* conception, since it occasionally happens that after pregnancy has begun corrective measures may be difficult or impossible to apply. On the other hand, it may also happen that the cause of the tendency to abortion is not evident until pregnancy starts. Hence we divide the subject into preconceptional and postconceptional treatment.

Preconceptional treatment may be directed toward correcting defects in the germ cells (sperm or ovum), toward the elimination of certain pelvic abnormalities and toward the treatment of systemic factors that tend to abortion.

Defective germ cells usually make impregnation impossible, but at times the union of ovum and spermatozoon does occur, but the product of this union may lack sufficient vitality to develop beyond the very early stages. The work of Dr. Streeter at the Carnegie Institute in Baltimore, recently corroborated by studies at the Boston Lying-in Hospital, has shown conclusively that these ovulogenic factors, either before conception or shortly thereafter, play an important part in the etiology of spontaneous abortions. Such cases of "blighted ovum", often associated with delayed or so-called "missed" abortion, constitute practically one-third of all the cases of spontaneous interruption of pregnancy.

The influence of the spermatozoon as a factor in these primary defects of the germ plasm has heretofore been greatly underestimated. We may perhaps profit by a study of the investigations of Williams and Savage on the defective sperm of bulls as a factor in producing abortion in cattle. There is clinical evidence that similar conditions exist in the human race. The influence of disturbed endocrine secretions, especially hypothyroidism, the relation of a high vitamine diet upon the activity of the sex glands and the influence of prostatic infection on the development of spermatozoa suggest many avenues for further study. Empirically it may be wise in cases of abortion to clear up prostatic infection by appropriate treatment, give thyroid extract in cases of hypothyroidism and institute a diet rich in vitamin E in the month preceding conception in order, possibly, to favor the development of normal active spermatozoa in the *husband*.

Even more important are the study and treatment of the underlying endocrine condition of the *wife*, for here we are concerned not merely with the development of a normal ovum but also with such a proper balance of internal secretions, pituitary, thyroid and follicle hormones, as will facilitate the implantation of the impregnated egg in the uterus.

Pelvic factors that should be corrected before conception are such as interfere with the normal growth of the implanted ovum. These include the removal of tumors, such as myomas of the uterus or ovarian cysts. Such tumors do not necessarily cause abortion, but in cases of repeated abortion we are justified in advising operative removal of the tumor to eliminate this possibly irritating factor. An infantile uterus or a septate uterus that does not permit the formation of an ample uterine cavity may require correction. In the case of an infantile uterus, giving pituitrin extract or wearing an intrauterine stem pessary or both may give the desired result. Very deeply lacerated cervices and markedly relaxed floors may favor the dislodgment of the ovisac in the second trimester of pregnancy and hence justify operative correction. Retroversion of the uterus has been often accused as an important cause of spontaneous abortion. While this is the exception rather than the rule, it is well to eliminate this factor by bringing the uterus forward and holding it there by means of a pessary before conception occurs.

The general physical condition of the prospective mother before conception should be improved in cases of repeated abortion. Since a low sugar tolerance may at times predispose to abortion, this should be tested and the diet regulated

appropriately, where abnormality is found. A diet rich in vitamin E is also desirable. Dilatation of a ureteral stricture, which Hunner claims to be a factor in abortion, is indicated. An infected appendix or gallbladder should be operated on if conditions justify. Of great importance, according to Curtis and others, is the removal of foci of infection. The nasopharynx, tonsils or teeth may harbor streptococci, which travel to the placental site early in pregnancy and produce lesions that result in abortions. Some patients have definitely been cured of habitual abortions by removing such foci of infection.

While it is better to begin preventive measures before conception occurs, it is unfortunately true that most patients do not seek medical advice until they are actually pregnant. Nowadays pregnancy patients come to us in the first months of gestation. At this time it is not enough for us merely to diagnose the pregnancy. We must also remember that *spontaneous* abortion occurs in about 10 per cent and that almost all of these take place within the first twelve weeks after conception. Every woman should, therefore, be given a complete physical examination to determine any abnormality or misplacement that may predispose to abortion. Routine basal metabolism and Wassermann tests are a wise precaution. The presence of foci of infection should be determined. A detailed history of any previous gestation should be obtained to see if there was any tendency to abort at that time. Patients with low fertility who have not conceived until a year or more has elapsed in the absence of contraceptive measures must be regarded as more likely to abort. The endocrine factors responsible for lowered fertility may also predispose to abortion. Hence such patients should be considered in the same category as those with previous abortions. Most important is the record of all previous abortions, for we know that under many conditions there is a tendency to repetition. If the normal incidence of spontaneous abortion is one in ten pregnancies, I think it is true that, where a spontaneous abortion has previously occurred, the ratio is not less than one in four or five pregnancies.

What then shall be our advice in apparently normal cases? Usually we may content ourselves with general instructions, such as the avoidance of undue physical strain, long automobile rides, too frequent sexual relations and constipation.

The unusual endocrine upset of the mother immediately following conception makes this phase of our subject most important. On the one hand we have a sudden, tremendous increase of the anterior pituitary-like substances, as shown in the Aschheim-Zondek test, and on the other hand we have the development of a corpus luteum whose secretory activity is an important factor in the implantation and early growth of the ovum. There is strong reason to believe that, when the secretion from these two sources is not properly balanced, there is an increased tendency to abortion. Unfortunately we are still groping at straws in the darkness that pervades this phase of our endocrine studies. How helpful it would be if someone would find for us a test for the functional activity of the corpus luteum, even half as reliable as the basal metabolism test in thyroid activity. A beginning has been made in the quantitative determination of anterior pituitary activity, but here, too, there are many difficulties of interpretation.

Clinically, however, evidence has accumulated with striking uniformity that the giving of corpus luteum extract, especially in the early months of pregnancy, results in the prevention of a considerable number of spontaneous abortions. Here again, as in the mercury treatment of syphilis or the radium treatment of cancer, we have an illustration of the fact that in the history of medical science our knowledge of therapeutic agents may precede our knowledge of the underlying causes of the disease. Whether there is an actual deficiency of corpus luteum extract or whether an excess of pituitary produces irritability of the uterine muscle that is counteracted by giving corpus luteum extract is a question that may take many years for solution, but we have good reason to believe that when corpus luteum is given for periods of time during the first four or five months of gestation the incidence of spontaneous abortion is materially reduced.

While the correction of conditions predisposing to abortion, such as thyroid deficiency, low sugar tolerance and focal infections, should, if possible, precede conception, it is of considerable value to institute appropriate treatment in the early months of gestation when there may still be time to head off the interruption of pregnancy.

A specific measure to prevent abortion that has been highly recommended by Sellheim and other German gynecologists is the injection of normal pregnancy serum. Sellheim injects ten cubic centimeters of the blood serum of normally pregnant women with negative Wassermann reactions intramuscularly every fourteen days in cases of habitual abortion. The blood is not always taken from the same patient and a continuation of the injection in the later months of pregnancy does not seem essential. He believes a smaller dosage may be equally effective. How the favorable effect of such serum injections is to be interpreted and whether further trial will confirm these results are matters for future study.

The correction of uterine retroversion in the first trimester of pregnancy to prevent abortion has been debated pro and con. It is doubtless true that in the majority of cases the uterus

will spontaneously rise to the correct position as it enlarges. Nevertheless it cannot be denied that there is some risk in leaving this correction entirely to nature. In most instances I would favor making an effort to bring the uterus forward and hold it there by means of a pessary until the fourth month, when it will automatically stay in position. I agree, however, with the criticism that too vigorous attempts at correction are more apt to induce an abortion than to prevent it, and hence I would favor only the use of gentle measures, such as the introduction into the vagina of a rubber bag filled with about two ounces of mercury, with the patient placed in the elevated hip posture. Such a treatment for twenty or thirty minutes will, with occasional repetitions, suffice to loosen adhesions and permit the uterus to be brought forward. At times assumption of the knee-chest posture twice daily for a few minutes will suffice to accomplish this same result.

Any factors that tend suddenly to increase pelvic hyperemia predispose to abortion and should be avoided. Sexual intercourse is therefore not permitted in the first three months of pregnancy and in some cases of habitual abortion should be interdicted throughout the gestation. Constipation must be corrected by medicine and diet and, especially if bed-rest is prescribed for one reason or other, the stools must be kept soft so that all effort at straining is avoided.

These efforts to avoid spasmodic contractions of the uterine muscle should be duplicated during the times of the expected menstrual period. The occasional appearance of slight flowing after conception has occurred is evidence of the continuance of such a menstrual wave during these early months. Additional precautions eight and twelve weeks after the last menstruation are therefore indicated. Absolute bed-rest for seven to ten days at such periods is often a valuable adjunct to success. Sedative medicine and the avoidance of excitement of any kind should be prescribed during this period.

When bleeding or uterine contractions have actually begun the difficulty of treatment is magnified, but it will still be possible, in the majority of cases, to head off the abortion, except in the presence of a defective ovum. Complete bed-rest, preferably in a hospital with nursing care, must be prescribed. In the middle trimester of pregnancy there is some advantage in elevating the foot of the bed. As long as there is evidence of uterine irritability, as shown by bleeding or contractions, opiates should be given in as large doses as are tolerated by the patient. Morphine, ¼ grain, hypodermically, repeated as indicated, is our first choice, but where this produces vomiting we must resort to other drugs. Occasionally, pantopon, 1/3 grain, or dilaudid, 1/32 grain, will be better tolerated by the patient. The barbiturates are of great value in quieting uterine contractions and in most instances produce a favorable sedative effect upon the patient. Here, too, we find patients who do not tolerate these drugs so that we must resort to bromides or other sedatives. Psychic rest is of great importance. That is one reason why hospitalization is well worth the added expense in habitual abortions. The petty worries about children and home have often an important, harmful effect. Most important is the cooperation of the mother in carrying out this policy of prolonged rest and a spirit of optimism on the part of the obstetrician. Patience is usually rewarded by success, always again excepting that not inconsiderable group where a defective germ plasm results in missed abortion. I do not know of anything in the practice of medicine that gives one the same inner satisfaction, the same feeling of accomplishment, that follows the successful termination of pregnancy and birth of a child to a mother who for years has had all her efforts to have a child frustrated by abortion.

We now come to the other side of the picture, to those women, twice as numerous, unfortunately, who consider abortion a thing to be desired rather than avoided. This induced abortion is the bigger and more difficult part of our problem. Again, as in the case of spontaneous abortion, we must seek methods of prevention and control by a careful analysis of the underlying causes. In Russia, where for a period of about ten years an investigation was made to determine the reasons why abortion was asked for, it was found that poverty was the reason given by 31 per cent of the women, too many children by 29 per cent, illegitimacy by 20 per cent, physical disability by 11 per cent and domestic discord by 8 per cent. Of course we cannot transfer these Russian statistics to our own country without reservation, but certainly poverty and too many mouths to feed are the prime motives for desiring interruption of pregnancy in every country in the world. While the Russian abortion problem is different from our own, we have learned much from their experiment. We now have unquestioned evidence that the primary maternal mortality from induced abortion where it is done in hospitals by physicians early in pregnancy is only one fiftieth as great as the mortality in those countries where abortions are secretly induced by patients, midwives or irresponsible physicians. We have also learned, however, that the sequelae of abortions, done on a wholesale basis as in Russia, are of very great importance. The harmful physical effects produced by abortion on these women were found to be so serious that Russia has recently been compelled to shift its policy of legalized abortion to one in which abortion is permitted only in the case of physical disability or in the case of nursing moth-

ers for nine months after confinement. At the same time the government has undertaken a vigorous campaign in educating women concerning contraception as a means of avoiding undesired pregnancies.

Since the beginnings of Christianity the church and the state in the civilized world have considered the induction of abortion a crime punishable on a par with the crime of murder. For centuries women sought relief from undesired pregnancies through devious channels, but in former times the problem was not so acute for there was little question of overpopulation. The average life span at that time was not much over forty years and half the children that were born died in infancy. With increasing longevity resulting from the advance of medical science in the past fifty years and especially with the marked reduction in infant mortality the size of the modern family would have increased enormously had there not been other deterrent agencies. The advent of the industrial era brought with it not only increasing wealth but also, for the masses in many cases, increasing poverty. So-called criminal abortion has therefore increased by leaps and bounds. Instead of being largely limited to cases of illegitimate pregnancy, it has become a widespread practice among married women, especially among the poorer classes.

Governments throughout the world have vainly sought to control this growing tendency to abortion by more rigid enforcement of the prevailing laws. In spite of all efforts, however, the number of women who died from septic abortion as a result of secret illegal instrumentation steadily increased. Here and there a midwife would be jailed or an abortionist doctor indicted. The record of prosecutions in this country shows that only an infinitesimally small number of the offenders are ever punished. Most striking in all these attempts at legislative control of this evil is the way in which juries, before which incontrovertible evidence of criminal abortion has been brought, almost uniformly give a verdict of acquittal. Regardless of what is written publicly upon the statute books, the average citizen will not agree to punish this act as a crime, since he himself might some day be in a position to want such an interruption of pregnancy. Another reason for the failure of the attempt to curb abortion by legal punishment is the confused and unintelligent wording of the statutes dealing with this subject. I did not realize how ridiculous and unenforceable our state laws actually are until I read the compilation prepared for me through a department of the University of Columbia Law School and published as an appendix to my recent book on abortion. Here in Massachusetts, if a physician interrupts a pregnancy for any reason, even if it threatens the life of the mother, he is subject to imprisonment up to seven years, and, if the woman dies, to imprisonment up to twenty years. How long are you going to sit by and see such statutes, allowing no exemption to physicians, remain as laws? Is it surprising that we cannot respect the laws of a state that permits such a situation?

A more effective way to control illegal abortion, but one that it will take many decades to attain, is the correction of the economic inequalities that make the bearing of more children an intolerable burden upon the poor, depleted mother. I realize that the extension of government aid in the form of bonuses, exemption from taxation and preferred employment to parents of large families is a two-edged sword. If carried to extremes, as Mussolini does with his prizes to mothers of fifteen children, it may do harm, but a moderate policy, by which the government grants some financial aid to those parents who have voluntarily assumed a greater obligation in the education and nurture of the coming generation than others, would seem to be justifiable. Measures tending to a wider distribution of wealth would also be helpful. The extension of free maternal care, limiting it not merely to confinement, but providing for assistance during pregnancy and the later puerperium, would lessen burdens for the mother and make her less desirous of interruption.

Ignorance of the real dangers attendant upon induced illegal abortion is appalling and a determined effort by all physicians to educate their patients upon these matters would prevent many a tragedy. I am daily amazed at the lightness with which many highly intelligent women regard instrumental abortion. Through backstairs gossip they hear how easy it is. Of the serious risks to life and health they are taking, they have no conception. Only too often the reasons for desiring an interruption are relatively trivial. It is your duty as physicians to head off these abortions, often done on the impulse of the moment. Young, recently married couples are apt to have exaggerated ideas of their financial difficulties. Certainly invalidism or sterility is too high a price to pay for such temporary financial relief. The fifteen minutes of your office hour spent in explaining all the dangers of induced abortion will be fully repaid by the gratitude of your patient in later years. No matter whether at times your words fall upon deaf ears, you must always do your duty as physicians to give a warning note.

Finally we come to the measure that must of necessity be our mainstay in the control of abortion, the prevention of the undesired pregnancy. Sexual relations between husband and wife are so intimately associated with our physical, eth-

ical and religious life that it is difficult to discuss this subject of contraception from an abstract scientific point of view. Up to a short time ago any measures that involved a planned family, a limitation of the number of children arising from the union of husband and wife, was looked upon as morally wrong by certain religious groups. With the advent of our knowledge of the so-called "safe period", a time each month when marital relations would not be likely to result in conception, these groups agreed that if this particular method was employed the limitation of offspring was not to be considered wrong. In principle, therefore, they accepted the idea of a planned, a limited family. How relatively insecure the observance of the safe period is in preventing conception has been amply proved. It would seem perfectly admissible for those that consider the observance of the safe period a proper procedure to seek some better method, which would be equally unobjectionable from a religious standpoint. Research along these lines could hardly be logically opposed by any groups, regardless of religion. Who can tell what may result from intensive studies concerning the increase or decrease of fertility by the use of hormones, serums or diet? I cannot understand, therefore, the logic of those that oppose all investigation of methods of limiting offspring because they cannot approve of some of the procedures that have thus far been suggested. I hope to see in the near future an agreement by the entire medical profession that the processes that increase or decrease the fertility of human beings are subjects worthy of careful scientific study, and I trust that each religious group will accept those methods that conform to its ideas of right and wrong and that are, at the same time, most certain to accomplish the desired end. If I have stressed this subject of contraception at so great a length, it is because the really effective control of induced abortion depends so largely upon the employment of means of preventing the undesirable pregnancy. The methods at present available are not wholly reliable and are certainly not simple of application by the unintelligent. By persistent research it is to be hoped that simpler and safer methods will be found. When this time comes, the control of induced abortion will have ceased to be the serious problem it is today.

From what I have said regarding the prevention of spontaneous and induced abortion it will be evident that we are looking to you, the coming generation of young doctors, for relief from present conditions. No field of medicine is so worthy of intensive scientific research as the study of those processes that are intimately bound up with the reproduction of the human race. The physiology and pathology of fertility and sterility, the blighted ovum, which after impregnation fails to develop, the forces that tend to dislodge the ovum after it is implanted, all demand the earnest study of the coming generation. But these questions cannot be solved in the laboratory alone, or in the clinic or the hospital. Abortion, especially induced abortion, has ramifications that extend into the economic and moral life of the community. It is not enough, therefore, for you to sit at your desk and prescribe for the sick. Your obligation is a greater one. You must share with the lawyer, the legislator, the educator and the social worker responsibility for the correction of a condition that is responsible for this appalling waste of human life and that so undermines the health and happiness of our mothers. You should not merely be participants, you should be the leaders in an effort to bring sanity and justice into our management of this situation. Not until you have done that have you fulfilled your obligation as physicians.



## THE NEW HAMPSHIRE MEDICAL SOCIETY

### MISCELLANY

HOSPITALS

Nurses and employees at the Mary Hitchcock Memorial Hospital, Hanover, have subscribed over $1,000 and 106 employees of Dartmouth College have contributed toward the hospital expansion. The subscriptions reported up to October 15 total $139,490.41.

More than $200 was received by the New Hampshire Memorial Hospital, Concord, on Donation Day, October 14.

The following New Hampshire hospitals are on the approved list of the American College of Surgeons: Berlin, St. Louis; Claremont, Claremont General; Concord, Margaret Pillsbury and New Hampshire Memorial; Dover, Wentworth; Exeter, Exeter; Grasmere, Hillsborough County; Hanover, Mary Hitchcock; Keene, Elliot Community; Laconia, Laconia; Nashua, Memorial and St. Joseph's; Peterborough, Peterborough; Manchester, Elliot, Notre Dame, Sacred Heart and Balch.

The most successful Donation Day on record was reported by the Margaret Pillsbury General Hospital, Concord, on October 29, after friends of the institution had left their gifts at the nurses' home. Cash amounting to $745 was received. A gift of $100 was also received from the Hospital Chapter, which designated that its gift should be expended for special furnishings.

The Portsmouth Hospital Guild held its monthly all-day sewing meeting on Friday, November 6. Sewing was done on kitchen aprons and babies' blankets, and a lot was accomplished.

The Woman's Board of the Littleton Hospital raised $1,000 for the purpose of establishing and equipping a laboratory and for the purchase of accessory equipment for the x-ray department. Among the new pieces of apparatus purchased is a "timer" attachment for the x-ray machine that regulates the time of exposure to a twentieth of a second, thus enabling accurate exposures being made in chest and soft tissue work. Miss Marion E. Shaw, B.S., is in charge of the laboratory.

### PERSONALS

Dr. and Mrs. Howard Thompson of Nashua recently returned from a seven weeks' trip to the Pacific Coast and Alaska where the doctor bagged an eleven foot Kodiak bear and other game. The Thompsons took 6,500 feet of motion pictures, 4,000 feet of which are in color.

Dr. John R. Perley and Dr. R. A. Hernandez of Laconia have been made Fellows of the American College of Surgeons. Dr. Perley is a graduate of Dartmouth and of the medical school of the University of Pennsylvania. Dr. Hernandez is a graduate of Indiana University and of Tulane University.

Dr. Frank E. Kittredge spoke briefly before the Nashua Rotary Club recently on histories of the Nashua Memorial and St. Joseph's Hospitals and the John M. and Mary Hunt Homes for the Aged. He also spoke before the graduates of the Laconia Hospital Training School on October 28.

Dr. Barbara Beattie of Littleton left on Saturday, October 31, for Harvard University to take a month's course in general medicine under the auspices of the Commonwealth Fund.

Dr. Clifton S. Abbott of Laconia was the speaker at the Sandwich Woman's Club on Tuesday, October 27. His subject was "Cancer."

### NURSES

Eleven nurses of the Elliot Community Hospital, Keene, were graduated at public exercises on Thursday, October 15. An address was given by Miss Marietta D. Barnaby, Director of the Central Nurses' Registry in Boston.

Graduation exercises were held on Saturday, October 17, at the Franklin Hospital for six graduates of the training school who completed courses in 1935 and 1936. Last year the graduation was omitted. Miss Mabel Parsons, Superintendent, was in charge of the event.

The quarterly meeting of the Executive and Advisory Boards of the Marlboro Nursing Association was held on October 9. The results of the membership canvass were discussed and plans for the sale of the tuberculosis and Christmas seals were talked over. The public health nurse, Miss Della A. Robbins, presented her quarterly report which read, in part, as follows: Total number of calls 334, of which 182 were free; medical 207; surgical 40; orthopedic 6; obstetric 41; newborn 29; welfare 11.

Six nurses of the Laconia Hospital Association were graduated on October 28. Dr. Frank Kittredge of Nashua, President of the New Hampshire Medical Society, gave the address. Dr. Clifton S. Abbott, President of the Hospital Staff and member of the Training School Committee, presented the nurses for graduation.

### TUBERCULOSIS CLINIC

Dr. L. B. Copenhaver of North Woodstock will serve as clinic physician at the Littleton Community House. The work was formerly done by Dr. Robert M. Deming of Glencliff. Dr. Deming was unable to serve at the clinic due to the fact that work at the sanatorium has increased during the past several years.

A tuberculosis examination clinic was held in Portsmouth on Friday afternoon, October 30.

The monthly tuberculosis clinic was held at the Elliot Community Hospital in Keene on November 24. Mrs. Mildred G. Aiken and Dr. Robert B. Kerr were in charge. No clinic was held in December.

### COUNTY MEETINGS

The annual meeting of the Rockingham County Medical Society was held on October 15, 1936, at the Exeter Hospital. Dr. Lewis M. Hurxthal, Chief of the Medical Department, Lahey Clinic, Boston, was the principal speaker.

The thirty-second annual meeting of the Hillsborough County Medical Society was held at Milford on Tuesday, October 27. Dr. Loren F. Richards of Nashua spoke on "The Value of Sex Hormones as Therapeutic Agents", while Dr. Charles H. Dolloff of Concord, Superintendent of the New Hampshire State Hospital, spoke on "The Hazard to the Physician in the Commitment of a Patient to the Hospital."

The Belknap County Medical Society held its annual meeting with the Women's Auxiliary at Campton on November 17. The doctors heard a discussion of "Surgical Technic" by Dr. Boardman M. Bosworth of New York City. The Auxiliary was addressed by Mrs. Carleton R. Metcalf of Concord, President of the Women's Auxiliary to the New Hampshire Medical Society.

# CASE RECORDS
## *of the*
# MASSACHUSETTS GENERAL HOSPITAL

ANTEMORTEM AND POSTMORTEM RECORDS AS USED IN WEEKLY CLINICOPATHOLOGICAL EXERCISES

FOUNDED BY RICHARD C. CABOT, M.D.

TRACY B. MALLORY, M.D., *Editor*

## CASE 23031

### PRESENTATION OF CASE

A 25 year old native automobile mechanic was admitted complaining of weakness.

About 1½ years before entry the patient had mild epigastric soreness, which recurred without relation to meals but was occasionally severe enough to keep him awake at night. X-ray studies were performed and were said to be negative. Medication prescribed at that time produced complete relief, and he felt perfectly well until 6 months before entry, when he developed pain in the lower abdomen, which was slightly crampy in character and recurred from time to time during the day. There was considerable flatus associated with this discomfort, and alkaline powders frequently produced relief. Six weeks ago he began to feel weak and tired. Palpitation and dyspnea occurred on moderate exertion and on one occasion, while climbing stairs, he had a spell that was characterized by profound weakness, nausea and vomiting. A physician was consulted, and a blood examination performed. He was given medication containing iron and four intramuscular injections of liver extract. Following one of these injections he fainted. After the fourth injection another blood examination was made, and the liver injections were discontinued. Since the onset of the weakness the patient has been unable to work, but there were no other associated symptoms of significance.

Physical examination showed a well-developed and nourished young man with markedly sallow skin and pallor of the mucous membranes. The left lobe and isthmus of the thyroid were slightly enlarged and firm, but no thrill or bruit was elicited. Small, pea-sized, shotty nodes were palpable on both sides of the neck. A single cherry-sized, firm node was palpable in each axilla, and the inguinal nodes were shotty in character bilaterally. The heart was not enlarged, but there was a systolic murmur heard best at the second right interspace. A short systolic and a questionable diastolic murmur were audible at the third rib, just to the left of the sternum. There was no associated thrill. The blood pressure was 145/60. There was tenderness of the abdomen in the midline about 2 inches beneath the xiphoid, and the right upper rectus muscle was slightly tense. The liver edge was barely palpable on deep inspiration. The spleen was not felt. There was a fine tremor of the extremities. The hands were warm and moist. The reflexes were hyperactive but symmetrical.

The temperature was 100°F., the pulse 120. The respirations were 20.

Examination of the urine was negative. The blood showed a red cell count of 790,000, with a hemoglobin of 30 per cent. The white blood cell count was 900. Only 25 white blood cells were counted, and of these 18 were polymorphonuclears and 7 lymphocytes. The smear showed macrocytosis with slight basophilia and no anisocytosis. The bleeding time was 4 minutes, the clotting time 16 minutes. The hemoglobin, as oxygen capacity, was 4.4 volumes per cent. The volume of cells was 8.2 per cent, the color index 1.3 and the volume index 1.1. Stool examinations were negative. A platelet count was 140,000. A reticulocyte count was 2.4 per cent. The nonprotein nitrogen of the blood was 27 milligrams, uric acid 3 milligrams, plasma protein 6.5 grams, cholesterol 210 milligrams. The van den Bergh was normal. Gastric analysis showed 55 units of free hydrochloric acid after histamine with a total acid of 65. The basal metabolic rate was +16.

A gastrointestinal series showed thin gastric rugae but was otherwise negative. A chest film showed the heart to be slightly increased in size without typical configuration. The lung fields were clear. Films of the pelvis, lumbar spine and skull exhibited no variation from the normal. A barium enema was negative.

On the third hospital day the spleen was palpable 2 centimeters below the costal margin. Liver extract was administered without evident response. The patient received several transfusions, and his red blood cell count rose slowly to 2,400,000. The white blood cell count rose transiently to 3,500, at which time the differential count showed 16 per cent polymorphonuclears, 80 lymphocytes, 1 monocytes, 1 eosinophils, and 2 basophils. At the end of the first week the temperature rose suddenly to 104°F. and gradually subsided. It remained normal until the twenty-first hospital day, when it again rose to 103°F. and fluctuated between 100°F. and 103°F. thereafter. At this time the patient had a sore throat, and there was marked reddening of the pharynx. No ulceration was evident, however. On the twenty-fifth hospital day a friction rub was audible over the left chest anteriorly and over the right lower chest anteriorly. There was considerable pain on swallowing. The white blood count at this time was 150. His condition became rapidly worse, and

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he died on the following day, 26 days after entry.

## Differential Diagnosis

Dr. Wyman Richardson: This is a man with a vague type of abdominal pain who develops anemia; and possibly there is a suggestion in the history that he might have been bleeding. The history is equivocal in regard to whether liver helped or not.

We have to consider definite glandular enlargement. Cherry-sized axillary glands are significant, whereas shotty glands in the cervical or inguinal regions alone are not; and later on you will find that the spleen is palpable. I would not pay much attention to the tenderness. I would assume that the heart murmurs were hemic, the high pulse pressure being due to anemia.

The significant features are a severe anemia and a marked leukopenia. The appearance of the smear suggests macrocytosis, but this is not corroborated by the volume index which is within normal limits. It must be considered, I think, a normocytic anemia with possibly a tendency to slightly larger cells than normal. The platelet count is said to be low but is not very low. The rest of the findings are normal. The presence of acid in the gastric contents is quite striking.

I shall briefly run through a differential diagnosis. In the first place hemorrhage is impossible with these blood findings. If he had had acute hemorrhage enough to cause a normocytic anemia of 700,000, he would not have survived. On the other hand, if he had had a chronic hemorrhage, it should have resulted in a hypochromic anemia, which was not the situation. The primary type of pernicious anemia is ruled out by the hydrochloric acid. The secondary type of pernicious anemia is not particularly suggested by the blood picture, and he did not respond to liver, so that is ruled out. There is no history of exposure to benzol, which would affect the white cells first. He has marked leukopenia. In benzol poisoning one would expect more involvement of the platelets and not such a severe anemia as he showed at the time he was admitted. There are other reasons why benzol need not be too seriously considered. The bleeding time was normal. Most severe cases of benzol poisoning show purpura and lack of platelets. Agranulocytosis, agranulocytic angina, is ruled out by definition because that disease should not involve other blood elements in any significant degree. If he has agranulocytosis it must be secondary to some other process.

A condition known as aplastic anemia is very difficult to talk about because it is a very confused affair. There is no way of knowing whether you are dealing with it from the pathologist's standpoint or the clinician's standpoint. Strictly speaking, it should be anemia with progressive diminution in all the blood elements and at autopsy should show an aplasia of the entire bone marrow. This is not aplastic anemia under these conditions because there is evidence of red cell regeneration and also the platelets are not diminished to the same degree as the other blood elements. There has been no bleeding and no purpura. It is not common to have enlargement of the spleen in aplastic anemia; and there are other reasons that I do not think of at the moment. I will not consider aplastic anemia, although some people do refer to it where there is evidence of red cell regeneration. I do not think that they feel very certain what they are talking about and believe that, in most of these cases, there is some idiosynerasy to a drug that may be unrecognizable. At least that is my guess. I cannot imagine any sepsis producing this extraordinary blood picture. I will cross it out, including acute vegetative endocarditis.

So we are left by exclusion with the diagnosis of acute aleukemic leukemia. If you consider the clinical picture more directly, you find a man of 25 years with a rapidly progressive course, who dies within a few weeks. He has general glandular enlargement, he has a very severe and progressive anemia of a normocytic type with some evidence of red cell regeneration, and he also has some symptoms suggesting hyperthyroidism. That clinical story would lead you to believe he had an acute leukemia, an aleukemic leukemia.

I believe that, if he did have any considerable number of abdominal symptoms, they might be explained either on the basis of anemia or conceivably on some functional disturbance in the abdomen as a result of his underlying condition, not on the basis of definite localized pathology.

Dr. Mallory asked me if I wanted to look at the smears. I very fortunately did not have time, and I doubt if they would have helped me. It is fair to say that a lymphocyte is a simple thing if you have a perfectly ordinary type of patient. If you have some extraordinary patient, the lymphoid cell may turn out to be something quite different; and it may be that these supposed lymphocytes were some form of stem cell. If this is a leukemia, I do not see much point in trying to classify it as any one of the three described types. I would say simply an acute aleukemic leukemia and let Dr. Mallory tell us what type of leukemia it is.

Dr. George W. Holmes: The x-ray examinations were negative except that of the chest which showed only a moderate increase in the heart shadow, particularly across the base. The

changes throughout the gastrointestinal tract were not remarkable.

DR. FRANCIS T. HUNTER: I saw this man for one moment. He had an enlarged spleen and an extreme leukopenia. I do not believe I have ever seen it as low before; it came down to 150 before death. Agranulocytosis does not have anemia, so that was out. We came down to some process of malignancy, presumably leukemia. Since the blood smear did not show anything significant I thought it was the lymphomatous type.

He had some radiation of the spleen in small doses before death.

### CLINICAL DIAGNOSES

Aleukemic leukemia (myelogenous).
Bronchopneumonia.

### DR. WYMAN RICHARDSON'S DIAGNOSIS

Acute aleukemic leukemia (undifferentiated).

### ANATOMIC DIAGNOSES

Leukemia, aleukemic, ? lymphoid.
Bronchopneumonia.
Pleuritis, acute fibrinous.
Pulmonary infarcts.
Thrombosis of the periprostatic veins.
Arteriosclerosis, slight.

### PATHOLOGICAL DISCUSSION

DR. TRACY B. MALLORY: The autopsy failed to show any enlargement of the spleen. It certainly would not have been palpable, since it weighed only a little over 200 grams, and 400 grams is about the lower limit that can be felt. However, if he had radiation directly over the splenic area, it is possible it may have been palpable at some previous time. The liver was slightly enlarged. He had thrombi in the periprostatic plexus of veins and he had a few terminal pulmonary emboli and lung infarcts. The lymph nodes were rather generally enlarged, and the bone marrow of the long bones was not remarkable. The bone marrow of the femur was distinctly red, suggesting some form of activity.

When we came to look at the slides the first five sections of bone marrow showed simple hyperplasia, including those from the femur and two from the vertebrae. The sixth section, however, showed obvious tumor. The spleen was entirely free from leukemic infiltration. I could not make a diagnosis of lymphoblastoma on the lymph nodes, but the liver showed slight infiltration of the portal areas with cells that were obviously immature and abnormal, a leukemic rather than an inflammatory infiltration. So we have from the postmortem findings only the one section of bone marrow and the liver in which we have evidence of a leukemic process. The spleen, the nodes, and the rest of the bone marrow are essentially negative. The diagnosis of leukemia, however, is considerably bolstered by a sternal puncture, which was done during life before he received any radiation, and it shows a very definite neoplastic process. As regards the nomenclature of the neoplasm, I cannot do any better than Dr. Richardson, who did not bother to look at the smear. The cells, I think, are more like lymphocytes than anything else but are undifferentiated enough so that it is impossible to be sure. In view of the autopsy I think we were very lucky to have cut down on a positive area in doing the sternal biopsy. It was evidently a very spotty infiltration in spite of the anemia.

DR. RICHARDSON: I wonder if this disease is not one of the entire blood forming system instead of just the white cells alone.

DR. MALLORY: There are certainly some leukemias in which the red cells are very definitely involved, actually being greatly increased at certain stages.

## CASE 23032

### PRESENTATION OF CASE

*First Admission.* A 60 year old English housemaid was admitted complaining of dysphagia.

Thirty-five years before entry the patient had had dull epigastric pain radiating to both upper quadrants and to the back, chiefly on the left side. The pain occurred about 15 minutes after meals and was burning in character. It usually lasted half an hour, was aggravated by food and was not relieved by soda. After 5 years of intermittent attacks she was operated upon for what was said to be an ulcer of the stomach. After the operation the patient was symptom-free for 5 years, when she had a recurrence of similar pain, less severe in character, coming on about once a week. This was not associated with nausea or vomiting. After about 4 or 5 years this discomfort, which was called "nervous indigestion" by her physician, gradually subsided. She remained well until 1½ years before entry, when she developed difficulty in swallowing. Initially solid foods, chiefly meat, seemed to stick in her throat for a few minutes and then pass down into the stomach, and occasionally the food was regurgitated. After about 6 weeks the dysphagia became more pronounced, and liquids likewise produced similar symptoms. Fifteen months before entry she was operated on at the Eye and Ear Infirmary, a web extending across the esophagus just beneath the thyroid was divided, and the esophagus was dilated by bougies. She remained well for 4 or 5 months, then the same

symptoms recurred. This time she again entered the Eye and Ear Infirmary where bougies were passed with relief. She was free from symptoms until 6 weeks ago, when dysphagia gradually recurred. For a year there had been weakness and a sensation of pins and needles in her fingers, associated occasionally with numbness. For 3 months there had been dyspnea on slight exertion and also soreness of the tongue and mouth.

Physical examination showed an emaciated elderly woman in no acute discomfort. There was a lemon yellow tint to the skin. The tongue was glossy and smooth, with a few small papillae in the center of its dorsum. The lungs were clear. The heart was not enlarged, but there was a rough, apical systolic murmur, unaccompanied by a thrill. The midline scar of the previous operation was noted, but the abdomen was otherwise negative. There was no impairment of position or vibratory sense. The knee jerks were hyperactive but symmetrically equal. No ankle jerks were elicited.

The temperature, pulse and respirations were normal.

Examination of the urine was negative. No Bence-Jones protein was found. The blood showed a red cell count of 2,900,000, with a hemoglobin of 45 per cent. The white cell count was 13,000, 88 per cent polymorphonuclears. The reticulocyte count was 0.4 per cent. Stool examinations gave occasional positive reactions to the guaiac test. A gastric analysis after histamine showed no free hydrochloric acid and the maximum total acid was 5. The icteric index was 3. The basal metabolic rate was +20. A liver function test showed no dye retention after 30 minutes. The average red cell diameter was calculated to be 6.5 microns. A proctoscopic examination was negative.

A gastrointestinal series showed slight narrowing of the esophagus but no well-defined abnormality. The stomach showed evidence of a resected pyloric end with a functioning posterior gastroenterostomy. A barium enema was negative. A chest film demonstrated tortuosity of the aorta and a slightly enlarged heart shadow. The skull and pelvis were normal.

Shortly after entry the patient was given liver extract and, although the red cell count gradually rose to 3,700,000, with 40 per cent hemoglobin, the reticulocytes remained below 0.9 per cent. On the fifteenth hospital day iron medication was instituted along with the liver, whereupon the reticulocyte level gradually rose to a maximum of 8.6 per cent at the end of 1 week. Subsequently the red count rose to 5,400,000, and the hemoglobin to 60 per cent. Throughout the remainder of the hospital course the reticulocytes remained elevated above 1.0 per cent and, at the time of discharge, on the thirty-sixth hospital day, her red count was 6,000,000, with 70 per cent hemoglobin. Another gastrointestinal series at this time showed increased size of the gastric rugae. On the afferent loop of jejunum a fleck of barium was noted 2½ inches from the stoma. There were no narrowing of the jejunum and no tenderness in the region. The fleck of barium suggested the possibility of an ulceration of the jejunum, but a positive diagnosis could not be made.

*Second Admission* (5½ years later). Following her discharge the patient was followed in the Out Patient Department and treated with iron, a high vitamin diet and liver extract. She was readmitted to the Eye and Ear Infirmary several times for bougie dilatation of the esophagus. Two weeks before reentry a gastroscopy was performed with no difficulty. The esophageal web was said to have been just barely felt during the passage of the instrument. At the angle of the stomach on the lesser curvature toward the anterior wall there was a smooth, rounded lesion, about 2 centimeters in diameter, which was elevated 1.5 centimeters above the mucosa. This was attached by a broad base and was not ulcerated. An x-ray examination shortly afterward showed passage of barium through the esophagus without delay. There was no evident abnormality in this region. The stomach was long and extended low into the abdomen, and there was a round filling defect about 2.5 centimeters in diameter on the anterior wall near the angle of the stomach, close to the greater curvature. The distal 2.5 centimeters of the antrum were smoothly contracted to a narrow tube opening into a large cap, which showed only slight deformity and normal rugae. There was a posterior gastroenterostomy proximate to the filling defect in the stomach.

The patient entered complaining of increasingly severe back pain. During the preceding year she had lost about 20 pounds. For about a month before reentry she had had five to ten daily attacks of severe knifelike pain, beginning in the left costovertebral angle and radiating posteriorly across to the right side. There was no other radiation, and the attacks occurred in waves of about 5 minutes' duration, each attack persisting for about 1 to 2 hours. They were partially relieved by pressure on the area of maximum pain and were never accompanied by other symptoms. There were no jaundice and no clay-colored stools. During her current illness she had felt considerably weaker than usual and was markedly depressed mentally.

Physical examination showed a poorly developed, emaciated, elderly woman with a slightly yellowish tint to the skin. The fundi showed slight narrowing of the arterioles but were otherwise negative. The tongue was smooth, reddened and shiny, and the papillae were markedly atrophic. A few firm pea-sized glands were

palpated in the posterior triangles high up in the neck. Examination of the chest was unchanged from that on the previous admission. The blood pressure was 170/90. A 3 by 3 centimeter mass was visible descending in the midline of the abdomen with inspiration. This, however, was barely palpable. No tenderness was elicited over the spinous process, but there was slight tenderness just below both costovertebral angles. No muscle spasm was observed in this region.

The temperature, pulse and respirations were normal.

Examination of the urine was negative. The blood showed a red cell count of 4,700,000, with a hemoglobin of 45 per cent. The white cell count was 9,600, 69 per cent polymorphonuclears. Several stool examinations were done; only one showed a positive reaction to the guaiac test. Gastric analysis showed no free hydrochloric acid. A blood Hinton test was negative. A lumbar puncture was negative.

X-ray examination of the chest was negative. An intravenous pyelogram showed prompt appearance of the dye on both sides. The pelvis, calices and ureter were normal on the left. On the right there was some distortion of the lower calices, but this was considered to be probably a congenital anomaly.

The patient was discharged on the twenty-fifth hospital day with a prescription of iron medication and a high caloric diet.

*Final Admission* (6 months later). Shortly before reentry a gastroscopy showed that the gastroenterostomy was widely patent. No peristalsis passed over it. The jejunum could be seen through the stoma and appeared to be negative. Close to the stoma on the anterior wall of the stomach was a nodular lesion, which was ulcerated along one edge and bled readily in this area. It was definitely elevated above the mucosa to a height of 1 to 2 centimeters and appeared to extend in part onto the anterior wall and lesser curvature. There was a separate, elevated nodule, 2 centimeters from the principal lesion, but possibly connected with it. The mucosa in the region of the tumor was very irregular and had a verrucose appearance. Large dilated veins were prominent, particularly in the upper portion of the stomach. The larger lesion was said to have grown markedly and to have been much more nodular than at the previous examination. The patient had spent the summer resting and had followed her instructions in detail. Her weight, however, had diminished 12 to 15 pounds during this time, and there were occasional episodes of dysphagia.

Physical examination showed no essential change from the previous admission.

Temperature, pulse and respirations were negative.

Examination of the urine was negative. The blood showed a red cell count of 4,600,000, with a hemoglobin of 60 per cent. The white cell count was 7,600. A stool examination showed a strongly positive reaction to the guaiac test.

A gastrointestinal series showed a normal esophagus. The posterior gastroenterostomy stoma was patent, and there was a filling defect in the stoma on the anterior wall, which had definitely increased in size and was more sharply outlined than in the previous examination. The distal third of the stomach showed a filling defect, which was constant during fluoroscopy.

The patient was treated supportively and on the seventh hospital day a laparotomy was performed.

## Differential Diagnosis

Dr. Myles Baker: To review her first admission, this is a woman of 60 whose presenting symptoms suggest that we are dealing with anemia and a curious dysphagia relieved by the passage of bougies. The physical examination bears out the impression of anemia. The subsequent laboratory work and x-rays give no indication of chronic blood loss. There is notably no evidence of malignancy in the stomach or in the colon. There is no note here of the appearance of the red blood cells under the microscope but, presumably, with a color index below 1.0, the predominating cell would have been a microcyte with a definitely visible deficiency in hemoglobin content and probably a good many hoop forms. The absence of response to liver extract and the success later with adequate iron medication are characteristic features of a clinical entity about which much has been written in the past few years, and to which have been given various names that would spread over the length of a paragraph. We may call it idiopathic hypochromic anemia. I well remember the first case showing this trinity of signs and symptoms—glossitis, dysphagia and anemia—that I had ever seen; she was a woman in her late forties, who came in on the wards with vague paresthesia, sore tongue, cracks at the commissures of the lips, an enlarged spleen, and, as I remember, a fairly normal red cell count with low hemoglobin. It was one of the cases that Wintrobe and Beebe* used in their study of the disease. The symptoms of this type of anemia are quite vague because, often, they are no more or less than those of fatigue, persistent ill health, vague gastrointestinal distress, flatulence, and irregular and intractable bowel habits, sometimes with very little emphasis placed on discomfort of the tongue and mouth and with no very striking dyspnea on exertion. Characteristically their color, as we have seen them, is parchment brown, rather than lemon yellow, and their hair an

*Wintrobe, M. M. and Beebe, R. T.: Idiopathic hypochromic anemia. Medicine 12:187 (May) 1933.

early gray. The nails, in the characteristic picture, show a peculiar spoon-nail deformity called koilonychia. The neuralgias and paresthesias that this woman had may be quite the outstanding symptoms. These patients may have fleeting neuralgias as manifestations of their mildly invalid state, but again it should be noted, as in this case here, that there are no defects in vibration sense or position sense, nothing to indicate actual disease in the posterior columns and none of the signs of combined system disease, either the characteristic type seen in pernicious anemia or the type so difficult of diagnosis, with minimal or no detectable change in the blood picture.

This patient has gastric anacidity, but an apparently normal blood picture so far as the morphology of the red cells is concerned. How important in simple idiopathic hypochromic anemia is the finding noted here of no free hydrochloric acid? Gastric anacidity is very much the rule, though a quarter or less of the cases will show free acid after histamine. Is the essential factor, absent in pernicious anemia, present here? Yes, it is, probably in diminished amount. These patients, usually middle-aged people, most often women at the time of the menopause, frequently have a story of inadequate dietary intake; but the dietary insufficiency is by no means always present. The etiology is unknown. There often are at least two factors—inadequate diet and gastric anacidity—that may play some part. Multiple pregnancies may be an important contributing factor. There is no note here of a palpable spleen, and certainly the spleen in a very appreciable number of the cases is palpable.

I would draw attention to the relation of her dysphagia to the presence of anemia. We do not know whether she was anemic or not on her admissions to the Eye and Ear Infirmary. The question is, does the local esophageal symptomatology precede the difficulty in eating and the anemia, or do they come on together? I remember one case here in which that question was violently argued. As I recall it, Dr. Mosher felt very definitely that there was esophageal obstruction or a web, and dilatations effected a cure. The anemia was simply the result of inadequate food intake. Others have pointed out, however, that the same local changes are present in the tongue, the buccal mucous membranes, the pharynx, the hypopharynx and the upper part of the esophagus. If they are associated with some deficiency in gastric secretions, the anemia associated with the latter may come on hand in hand with the dysphagia and perhaps precede it.

We should make further mention of one factor in her hospital course—the very definite response to iron after failure of any reticulocyte rise during the course of liver extract. Dr. Clark Heath has reported on the oral use of iron in hypochromic anemia, giving reticulocyte counts, after adequate iron therapy, from a series of cases that illustrate the effect to be expected at varying levels of red cell count and hemoglobin. The response here was apparently gratifying without recourse to parenteral iron. Iron can be given into the muscle in relatively small doses but may be a rather painful form of therapy. The good response to iron almost certainly created the impression in the minds of the house staff that they were not dealing with malignancy and chronic blood loss as the cause of her anemia. I can remember, however, two or three instances where the attending doctors' enthusiasm for this new clinical entity has led them to miss cancer of the stomach or cancer of the sigmoid. The patient comes into the hospital, receives adequate dietary care and may improve for a little while, only to have someone else, after his discharge from the hospital, discover the neglected malignant process, which has finally made itself evident.

It should be noted in passing that there does tend to be some familial relation between the simple hypochromic anemias and actual pernicious anemia. I remember a family in which two sisters had pernicious anemia and another sister hypochromic anemia. There are borderline cases that are difficult to distinguish one from the other, and probably they sometimes merge into one another. Let us pass to the x-rays.

DR. RICHARD SCHATZKI: The pyloric region is not filled, and no barium is in the duodenal cap, due to the anastomosis, which lies at the lower portion of the stomach. These areas where there is apparently less barium represent the gastric rugae. They are widened compared with the average normal patient. This widening of the rugae is very commonly found in any postoperative stomach, due to gastritis, which can be seen by gastroscopy. I see that a fleck in the afferent loop is mentioned in this note. This certainly would be a very unusual place for a peptic ulcer. They occur rather frequently after gastroenterostomy, usually close to the anastomosis or in the efferent loop. The appearance of the fleck itself is not too suggestive of ulcer, and the surrounding mucosa seems to be perfectly all right.

DR. BAKER: This type of case was reported and reviewed 15 years ago by Dr. Vinson at the Mayo Clinic under the head of "Hysterical Dysphagia." Many of his cases were anemic but he felt the effect of dilatation by instrument and subsequent precautions about eating were enough to support the argument that most of these individuals were hysterical. You sometimes hear of the so-called Plummer-Vinson syndrome—dysphagia, anemia and enlarged spleen—with hypochromic anemia. Certainly this pa-

tient's symptoms up to the end of her first admission fit the syndrome perfectly, and I imagine she was discharged with a diagnosis of a Plummer-Vinson syndrome.

Dr. Schatzki will now show us the films of the second admission.

DR. SCHATZKI: This is the lower pole of the stomach. You can see some barium filling the cap. It does not seem deformed. This is quite interesting, considering the fact that she had been operated on for a presumptive duodenal ulcer. Close to the anastomosis you see a defect, which is clearly outlined in this film taken under the fluoroscope. You can see that the defect is slightly lobulated. It could not be shifted with palpation. There was no tenderness. Though the lesion was close to the anastomosis, it did not interfere in any way with the passage of the barium through the anastomosis. Let us compare this with the original film. You see that this defect definitely was not there 5 years ago.

A STUDENT: If she had had an ulcer previously, would you have expected to find a deformity in the duodenal cap?

DR. SCHATZKI: Healing without deformity may occur; but usually not in ulcers that are so severe that they necessitate an operation.

DR. BAKER: We now have unquestionable gastroscopic and x-ray evidence of stomach tumor which may be either benign or malignant. Comment seems necessary at this point about the nature of the back pain which this woman experienced and which led to her restudy with gastroscopy and roentgenologic observations. It has been the experience of those who have reviewed many cases of retroperitoneal tumors, notably cancer of the pancreas, that paroxysmal back pain, often with reference to one side, left or right, is not infrequently to be elicited in taking the history of these patients. It may be explained on the basis of an intimate relation between the neoplasm and the solar plexus. It is not characteristic, to my way of thinking, of malignancy of the stomach unless we are dealing with a penetrating growth. These attacks had been experienced only in the month before admission. I am at a loss at this point to understand why she was discharged from the hospital with such definite evidence of gastric pathology. There was, to my mind, a lesion that warranted surgical intervention. We might as well pass on to the final admission.

DR. SCHATZKI: This is a film taken on her last admission. You can see that it has grown within 6 or 7 months. Here is the small lesion just above the big one, which the gastroscopist's report mentioned. In fluoroscopy one may obtain some impression of the consistency of a lesion, though one cannot actually palpate it. If you have a rigid lesion, you see the whole lesion lighten up at once if you touch it at any place. If it is not rigid, only the place you touch is visible. This one was very soft.

DR. BAKER: Does the second lesion show in the film of the whole stomach? The man who did the examination considered the rest of it spasm in the lower part of the stomach. The surgeon who did the gastroscopy spoke of there being a separate, elevated nodule.

Is there anything about this observation by x-ray that would give us hope that we are dealing with an adenomatous polyp?

DR. SCHATZKI: I think it is consistent with an adenomatous polyp if you had only one observation. A broad-based adenomatous polyp could produce this picture.

DR. BAKER: This patient, who for years had been a problem to the doctors, as an interesting case of anemia with unknown etiology, became a much more serious problem in these last 7 months of her stay.

We are dealing with a demonstrable lesion involving the mucous membrane of the stomach, which bled readily and which immediately raised the question of malignancy. Are we dealing with cancer of the stomach? Or is there a possibility that she had one or two adenomatous polyps that had been bleeding and that had contributed very chronic blood loss to the anemia and uncontrollable dysphagia of the past few months? It is hard to tie together her episodes of severe paroxysmal back pain with a benign lesion in the stomach. But it must have been in the hope of finding a benign polyp that they operated on this patient. It is true that in patients who have pernicious anemia one must always bear in mind the possibility of chronic blood loss from gastric polyp. I do not recall an instance of adenomatous polyp in the stomach in a case of idiopathic hypochromic anemia. My preoperative diagnosis would be idiopathic hypochromic anemia, uncontrolled, and adenocarcinoma of the stomach, bearing in mind the possibility of a broad-based adenomatous polyp, which was not yet a site of malignant degeneration. My explanation for the pain would be retroperitoneal metastases from carcinoma of the stomach.

### CLINICAL DIAGNOSES

Carcinoma of the stomach.
Primary hypochromic anemia.
(Plummer-Vinson syndrome.)

### DR. MYLES BAKER'S DIAGNOSES

Adenocarcinoma of the stomach.
Gastric polyp?
Idiopathic hypochromic anemia.

### ANATOMIC DIAGNOSIS

Polypoid adenocarcinomas of the stomach.

## Pathological Discussion

Dr. Benjamin Castleman: I am sorry that I do not have the specimen to show you. It was completely cut up to obtain serial sections of the lesions. The resected stomach showed on the anterior wall a polypoid tumor about 3 by 2 by 2 centimeters, which had been seen by the gastroscopist and by x-ray. It had a broad firm base. In addition there was another smaller polyp, which measured about 1 centimeter in diameter. This tumor was not so firmly fixed. Grossly we were not at all certain whether the latter was merely a benign adenomatous polyp or whether it was a carcinoma; the larger one strongly suggested cancer. With both of them, however, we felt quite sure that, if they proved to be carcinomatous, they had been polyps at one time and had only recently become malignant. The histologic sections of the larger polyp show obvious invasion of the tumor into the submucosa and a diagnosis of adenocarcinoma must be made. The smaller polyp does not invade so much, although there is a slight degree of invasion. The epithelial cells making up the tumor, however, are very atypical, and on their morphology alone one might be justified in calling the lesion carcinoma in situ or precancerous.

Following operation the patient at first did fairly well but then developed parotitis and finally bronchopneumonia and died. The autopsy did not show anything further in her stomach. No duodenal ulcer or scar was found. We were unable to find any web in the esophagus.

The regional nodes in the resected stomach and the retroperitoneal nodes at autopsy showed no metastases. We did, however, find a cause for her severe back pain. She had fairly large, old infarcts in both kidneys, though we could not find any satisfactory cause for them. The aorta was arteriosclerotic, and it is conceivable that it did have, at one time, ulcerations and thrombi, a few of which broke off and entered the renal arteries.

Several years ago Dr. Suzman* reported the autopsy findings on a case of dysphagia with hypochromic anemia from this hospital. There was marked hyperkeratinization of the mucosa of the tongue and esophagus, with atrophy of the underlying muscles. It was felt that this epithelial change had led to the formation of the web.

I agree that in this syndrome the anemia probably precedes the dysphagia, and the idea that obstruction is the cause of the anemia has been discarded. Many cases have been reported where the anemia did precede the dysphagia.

A Student: Why was she not operated upon during her second admission?

Dr. Edward B. Benedict: Dr. Jones and Dr. Young agreed that she was too frail a woman. She weighed only 85 pounds or less, and with this little nubbin on the stomach it did not seem reasonable to do surgery when there was some reason to believe it was benign. The x-ray department said it was benign. I do not know what I said at the time. I believe I said it was benign. Between the second and third admissions the rapid growth of the tumor convinced us that the risk of operation had to be taken.

*Suzman, M. M.: Syndrome of anemia, glossitis and dysphagia; report of 8 cases, with special reference to observations at autopsy in one instance. Arch. Int. Med. 51:1 (Jan.) 1933.

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## ABORTIONS AND CONTROL

THE closing words of Taussig, in his discussion of abortion and its control in this issue of the *Journal*, are an appeal to the medical profession, especially to the younger members, to find relief from the conditions with which physicians and society are confronted in connection with the need for, and the practice of, a sane and just control of this procedure, which has become such an important cause of maternal deaths. There is no way of computing with accuracy the actual number of fetal deaths, but Taussig's figures give an estimate of about half a million a year for illegal abortions in the United States. It is probably a conservative estimate.

The roots of the problem are so numerous and reach down so far into the deep springs of action in human nature that no simple and easy solution is to be found. It is not merely a question of economics, of making it pay to have children. In a certain type of agrarianism, it might be more profitable, for a while, to raise children to work on the farm. In a civilization as largely industrial as our own, even subsidies do not offer much hope in the way of prevention. Furthermore it would appear that the more money one has the easier it is to secure a criminal abortion. Then there is the problem of women illegitimately pregnant, a problem as old as the idea of legitimacy. There are those persons, who style themselves realists, who may well say the difficulty in getting rid of the criminal abortionist is that his function is necessary in society, human nature being as it is. The solution offered by this group is to change the law so that it would fit the facts of life. But, say the opponents, while it may be that certain statutes do need changing, there are other facts of life that make the merely legal approach not trivial but highly objectionable. Fundamental, irreconcilable differences of opinion are involved. Practically, legalized abortion in Russia, however successful in terminating the pregnancy, seems to have been far from satisfactory for the later welfare of the mother.

Why not try to prevent abortions by preventing pregnancy? Taussig claims this must "be our mainstay in the control of abortion". He goes on to say: "Up to a short time ago any measures that involved a planned family, a limitation in the number of children arising from the union of husband and wife, was looked upon as morally wrong by certain religious groups." There is here an inaccuracy of statement, which, however slight verbally, is by no means slight potentially. The statement should read "any measures except continence".

There are certain persons who, showing in other matters evidence of toughmindedness, cannot accept contraception (for other than purely medical reasons) with the enthusiasm of its missionaries. They may not be able to formulate their objections very clearly. Interference with a fundamental natural process in order to prevent its consummation, in the case of mating, the production of offspring, is to them, at least, unesthetic, and suggests immorality. The sin of Onan was due to his selfishness. He may not have been a strict hedonist, but he refused to accept what was accounted a responsibility and received moral condemnation according to standards that we have outgrown. But in what can lie the immorality?

The poet sings of "self-knowledge, self-reverence, self-control", of which, if one is more nearly perfect than another, it is self-control that is the highest attainment. The danger of contraception is not so much in its physical effects — science may perhaps achieve perfect safety and perfect prevention of conception—as in its tendency, nay more, in its definite contribution, to the undermining of morale. It says

that, in the field of sexual intercourse, self-control may be thrown to the winds; it no longer has any pertinence in the consideration of physiologic results.

Even if one finds, perchance, an advocate of contraception who acknowledges possible harm from its effect on character he will probably take the position that his course, while perhaps not entirely unobjectionable, seeks the lesser evil. It is his tentative hold on this position that has a saving quality, for time alone will tell whether the by-products are worse than the evil from which relief is sought.

But why discuss morale in this connection? Penetrating critics of contemporary life have thought they detected a growing lack of nerve, in the sense of that fine courage which instinctively, as it were, turns *toward* danger, facing it squarely, rather than *away from* it, seeking to avoid. How widespread this lack of nerve is in all strata of society, perhaps only the physician that deals with mental cases knows, but abundant evidence of its existence is found in novels of the day. Escape, in contemporary phrase, means to run away from, but we know better than that. We escape smallpox by positive vaccination. We escape disease by positive health. Yet the spirit of defeatism is widespread. That is the deeper meaning of the dictatorship, which must be popular to endure; it is an escape mechanism, in the weaker sense of escape, for the defeated.

Thus there is a danger, of the existence of which the growing popularity of contraception, apart from continence, is an indication, and to the increase of which contraception contributes. When in any civilization, self-control is unequivocally cast to the winds in any important department of life, decline begins. The decadence of the Athenian empire may be marked from the day when the Athenian people declared that it was intolerable that they should not do as they pleased.

## GOVERNOR HURLEY'S INAUGURAL ADDRESS ON THE CARE OF THE MENTALLY DISEASED

Governor Charles F. Hurley, in his inaugural address delivered on January 7, brought to the attention of the Legislature a specific matter of considerable medical interest: the problem of the state care of the mentally diseased. This is a subject which must be of continued interest to the government of the Commonwealth, since under normal conditions the care of the mentally afflicted has absorbed about one-quarter of the active income of the state.

Even so, the need for institutional care has rapidly outgrown the available facilities, as is evidenced by the Governor's annual message of a year ago. At that time Governor Curley pointed out that our twelve state institutions, with a working capacity of 17,671 patients, were caring for 21,023 and that the three state schools under the Department of Mental Diseases were caring for 5,051 patients, with a working capacity of 3,893. It was then urged that the twelve hospitals be speedily enlarged to care for 2,000 patients each and that the three state schools be each brought up to the same capacity.

Governor Hurley, however, advances the thesis that the responsibility for many individuals that could and should be cared for at home has been thrown upon the Commonwealth, voicing the fear that without a scientifically limited and publicly approved program the Department of Mental Diseases might conceivably come under the control of a group that would define efficiency in terms of numbers of inmates and of unlimited extension of building operations and personnel.

However real this danger may be, all will agree with the wisdom of His Excellency's request to the Legislature that he be empowered to appoint a selected commission to consider the whole matter of the mentally diseased in their relation to the Commonwealth and to submit a complete program, including a plan for building operations that would envisage our needs for the next decade.

## REPUTABILITY OF A MEDICAL SCHOOL

In many states the board of registration in medicine has the power of deciding whether a medical school is reputable for the purpose of determining the eligibility of a graduate of that school for examination to practice medicine. The term "reputable" is after all not a satisfactory characterization for, if reputation is the basis for judgment, no new school could be acceptable, because a certain amount of time and a certain amount of activity are necessary for the development of a reputation. Again, reputable is not the best word for its antonym is disreputable, and a medical school might be inadequate in teaching staff and in equipment and still not deserve the opprobrium of being called disreputable.

In a recently reported court decision in Wisconsin, the determination of the reputability of a medical school was at issue. A candidate who was a graduate of a medical school in Illinois had been licensed in that state. He sought registration in Wisconsin without examination, permissible by statute on fulfilment of certain conditions, one of which is the presentation of a license and a diploma from a reputable medical school.

The Wisconsin board of medical examiners had refused registration on the ground that it

did not recognize the Chicago Medical School as a reputable medical college. One question before the supreme court was whether the procedure of the board in determining the reputability of the school was "reasonable", no specific method of determination being enjoined by the statute.

The complainant had demanded a hearing which he insisted should be conducted as ordinary court procedure is carried on. The board refused the demand and was upheld by the court. Even the right of the complainant to a hearing was denied by the court. The Chicago Medical College had never been deemed reputable by the board, and nothing would have been taken away from the college or from the candidate by refusing to grant a hearing. Actually, reasonable notice had been given to the medical school and to the complainant and his attorney for opportunity to present evidence to the board. The board had refused to permit the complainant and his attorney to be present when the representatives of the medical school testified before the board and had refused also to have the testimony recorded in shorthand and transcribed.

It was entirely within the province of the board to lay down these conditions if they saw fit to permit representations, and what had been done was reasonable. There had been no restriction on the furnishing of evidence. An administrative board is not bound by the rules of court procedure.

This decision of the supreme court of Wisconsin is not especially pertinent for the Massachusetts Board of Registration in Medicine in its dealings with medical schools, as the new statute contains the characterization "approved by the approving authority" rather than "reputable" and some of the details of the procedure, for example, "a public hearing", are provided by the law. But for all boards of registration that accept only the graduates of "reputable" schools, the decision is interesting and pertinent and may be helpful as it tends to clarify the meaning of "reasonable" procedure.

## THIS WEEK'S ISSUE

CONTAINS articles by the following named authors:

CANNON, WALTER B., M.D. Harvard Medical School, 1900. LL.D. George Higginson Professor of Physiology, Harvard Medical School. Address: Harvard Medical School, Boston, Mass. His subject is "Experimental Neurology in the Harvard Medical School." Page 89.

WHITE, JAMES C., M.D. Harvard Medical School, 1923. F.A.C.S. Assistant Professor and Tutor in Surgery, Harvard Medical School. Assistant Visiting Surgeon, Massachusetts General Hospital. Address: Massachusetts General Hospital, Boston, Mass. His subject is "Recent Developments in the Surgery of the Sympathetic Nervous System." Page 91.

AYER, JAMES B., M.D. Harvard Medical School, 1907. James Jackson Putnam Professor of Neurology, Harvard Medical School. Chief of the Neurology Service, Massachusetts General Hospital. Address: The Longwood Medical Building, 319 Longwood Avenue, Boston, Mass. His subject is "Myasthenia Gravis." Page 95.

MITCHELL, ROGER S., M.D. Harvard Medical School, 1934. Graduate Assistant in Neurology, Harvard Medical School at the Massachusetts General Hospital, during 1936. Address: 191 Glen Street, Glens Falls, New York. His subject is "Experience with Oral Prostigmin Therapy in Myasthenia Gravis." Page 96.

DAVIS, HALLOWELL, M.D. Harvard Medical School, 1922. Formerly, Frederick Sheldon Travelling Fellow. Instructor in Physiology, Harvard Medical School. Instructor and Tutor in Premedical Sciences, Harvard College. Instructor in Biology, Tutor in the Division of Biology, and Chairman of the Board of Tutors in the Division of Biology, Harvard College. Secretary of the Division of Medical Sciences, Harvard University. Assistant Professor of Physiology, Harvard Medical School. Now, Associate Professor of Physiology, Harvard Medical School. Address: Department of Physiology, Harvard Medical School, Boston, Mass. His subject is "The Electrical Activity of the Human Brain." Page 97.

GIBBS, FREDERIC A., M.D. Johns Hopkins University School of Medicine, 1929. Research Fellow in Neurology, Harvard Medical School. Address: 410 Memorial Drive, Cambridge, Mass.

LENNOX, WILLIAM G., M.D. Harvard Medical School, 1913. Sc.D. (Hon.) Assistant Visiting Neurologist, Boston City Hospital. Assistant Professor of Neurology, Harvard Medical School. Address: 47 Dudley Road, Newton Centre, Mass. Their subject is "The Electrical Activity of the Brain in Epilepsy." Page 98.

COBB, STANLEY, M.D. Harvard Medical School, 1914. Bullard Professor of Neuropathology, Harvard Medical School. Psychiatrist-in-Chief, Massachusetts General Hospital. Vice-President, Judge Baker Guidance Center and Association for Research in Nervous and Mental Diseases. President, Boston Society of Psychiatry and Neurology. Address: Massachusetts General Hospital, Boston, Mass.

FORBES, HENRY S., M.D. Harvard Medical School, 1911. Research Fellow in Neuropathology, Harvard Medical School. Address: Harvard Medical School, Boston, Mass. Their subject is "The Cerebral Circulation." Page 99.

WEISS, SOMA, M.D. Cornell University Medical College, 1923. Associate Professor of Medicine, Harvard Medical School. Director, Second and Fourth Medical Services (Harvard), Boston City Hospital. Address: Boston City Hospital, Boston, Mass. His subject is "Syncope and Collapse." Page 102.

PUTNAM, TRACY J., M.D. Harvard Medical School, 1920. Professor of Neurology, Harvard Medical School. Visiting Neurologist, Boston City Hospital. Address: Boston City Hospital, Boston, Mass. His subject is "Venous Thrombosis as the Primary Alteration in the Lesions of 'Encephalomyelitis' and Multiple Sclerosis." Page 103.

GOETHALS, THOMAS R., M.D. Harvard Medical School, 1916. Associate in Obstetrics, Harvard Medical School. Obstetrician, Massachusetts General Hospital. Assistant Visiting Obstetrician, Boston Lying-in Hospital. Address: 475 Commonwealth Avenue, Boston, Mass. His subject is "A Consideration of 'Rhythm' as a Measure for Birth Control." Page 104.

TAUSSIG, FRED J., M.D. Washington University Medical School, 1898. F.A.C.S. Professor of Clinical Obstetrics and Clinical Gynecology, Washington University School of Medicine. President, Central Association of Obstetricians and Gynecologists, 1931-. President, American Gynecological Society. Address: 3720 Washington Avenue, St. Louis, Mo. His subject is "The Control of Abortion." Page 109.

## The Massachusetts Medical Society

### STATED MEETING OF THE COUNCIL

A STATED meeting of the Council will be held in John Ware Hall, Boston Medical Library, 8 Fenway, on Wednesday, February 3, 1937, at 11 a. m.

*Business:*

1. Call to order at 11 a. m.
2. Reading record of last meeting in abstract.
3. Obituaries of Councilors who have died since the last meeting.
4. Report of Auditing Committee and of Treasurer.
5. Reports of Standing Committees.
6. Reports of Special Committees.
7. Appointment of new Committees.
8. Appointment of Delegates.
   (a) To the House of Delegates, American Medical Association, for two years from June 1, 1937.
   (b) To the Annual Meetings of the five New England State Medical Societies in 1937.
   (c) To the Annual Congress of the American Medical Association on Medical Education and Licensure at the Palmer House, Chicago, February 15, 16 and 17, 1937.
9. Incidental business.

ALEXANDER S. BEGG,
*Secretary.*

Councilors are asked to sign one of the two attendance books before the meeting. The Cotting Luncheon will be served immediately after the meeting.

### SECTION OF OBSTETRICS AND GYNECOLOGY*

R. S. TITUS, M.D., *Chairman*, 472 Commonwealth Ave., Boston, Mass.
ROY J. HEFFERNAN, M.D., *Secretary*, 1101 Beacon St., Brookline, Mass.

#### CASE HISTORIES

##### No. 3. COMPLETE MISCARRIAGE

Mrs. H. F., a white woman, 30 years old, was seen in the office on November 15, 1933. She came in for the diagnosis of pregnancy, her last period having occurred on October 4, 1933. She was extremely nervous and sought advice early to make sure that her pelvic condition was normal and consistent with early pregnancy. At the time of her visit she had no complaints, felt fine and was extremely happy to have become pregnant.

There was nothing remarkable in her family history except for twins on the paternal side. She had previously enjoyed good health. She had been treated for 3 years for a vaginal discharge, which occurred previous to and following her periods. Suppositories and douches, which had been recommended, had given some relief. Her tonsils and adenoids had been removed when she was 12 years of age. She began to menstruate when 13 years old, her periods occurred every 30 days and she flowed for 3 to 4 days, using 2 or 3 napkins a day. There had been no dysmenorrhea, and the flow had been free of clots.

The physical examination revealed a well-developed woman, weighing 130 pounds. Her teeth were well cared for, and her breasts were

*A series of selected case histories by members of the Section will be published weekly.
Comments and questions by subscribers are solicited and will be discussed by members of the Section.

normal, as were her heart and lungs. The abdomen showed no abnormalities and the uterus, which was slightly larger than normal, was in the forward position. The cervical arteries were palpable, and the cervix was slightly softened. The pelvic canal felt adequate for the delivery of a normal-sized baby. Her external pelvic measurements were intercristal 29 cm., interspinous 24 cm. and external conjugate 20 cm., and her arch was ample. Her hemoglobin, according to the Tallqvist scale, was 80 per cent, while her systolic blood pressure was 106, with a diastolic of 60, and a pulse rate of 80.

On November 24, 1933, while at stool, she had a sudden gush of blood, which was followed by a constant trickle throughout the day; the flow was painless. She was advised to stay quietly in bed on a soft diet, and cathartics were prohibited. Two days later she complained of cramps low down in the pelvis with an increase in the amount of the flow. Morphine sulfate in 1/4 grain doses was administered subcutaneously. Despite this the cramps and bleeding increased, and in the late afternoon she passed a complete sac containing the fetus and an early placenta. After the expulsion of the products of gestation, 16 minims of posterior pituitary extract were injected; this soon decreased the bleeding. Fluid extract of ergot in drachm doses was given three times a day for 48 hours. She was kept in bed for 3 days and allowed up and about on the fourth day. There was no elevation of the temperature at any time. Four weeks later bimanual examination demonstrated a normal pelvis; the uterus was in forward position, the adnexa showed no abnormalities and the parametria were supple.

The conservative method of treatment for a complete miscarriage, as illustrated by this case report, is the one generally accepted. A number of obstetricians, however, prefer to keep their patients in bed for about 8 days after such an episode, in order to favor involution and to prevent a recurrence of the bleeding, which may frequently happen if the puerpera is allowed out of bed too soon.

## BOSTON MEDICAL LIBRARY

### RECENT ACCESSIONS

Favill, J.: The Relationship of Eye Muscles to Semicircular Canal Currents in Rotationally Induced Nystagmus. Chicago, 1936. 28.Q.34.

Gift of Dr. John Favill.

Cushny, A. R.: A Text-Book of Pharmacology and Therapeutics on the Action of Drugs in Health and Disease. Eleventh Edition. Philadelphia: Lea & Febiger. 1936. 22.I.80.

Boyd, W.: The Pathology of Internal Diseases. Second Edition. Philadelphia: Lea & Febiger. 1935. 8.A.489.

Howell, W. H.: A Text-Book of Physiology. Thirteenth Edition. Philadelphia and London: W. B. Saunders Co. 1936. 4.A.402.

Weber, F. P.: Endocrine Tumours and Other Essays. London: H. K. Lewis & Co., Ltd. 1936. 1.Ha.459.

Gift of Dr. Henry R. Viets.

Luten, D.: The Clinical Use of Digitalis. Springfield: Charles C Thomas. 1936. 15.E.321.

Hinton, W. A.: Syphilis and Its Treatment. New York: The Macmillan Company. 1936. 12.V.703.

Gift of Dr. W. A. Hinton.

Cobb, S.: A Preface to Nervous Disease. Baltimore: William Wood & Company. 1936. 19.A.29.

Gift of Dr. Stanley Cobb.

Pardo-Castello, V.: Diseases of the Nails. Springfield and Baltimore: Charles C Thomas. 1936. 27.Q.2.

Jackson, C. and Jackson, C. L.: Diseases of the Air and Food Passages of Foreign-Body Origin. Philadelphia: W. B. Saunders Co. 1936. 20.D.118.

Geschickter, C. F., and Copeland, M. M.: Tumors of Bone (Including the Jaws and Joints). Revised Edition. New York: American Journal of Cancer. 1936. 18.H.2.

Gift of Dr. Charles F. Painter.

Castle, W. B., and Minot, G. R.: Pathological Physiology and Clinical Description of the Anemias. Edited by Henry A. Christian. New York: Oxford University Press. 1936. 14.C.34.

Gift of Dr. William B. Castle.

Pharmacopoeia of the United States of America. Eleventh Decennial Revision (U.S.P. XI.). Official from June 1, 1936. Easton: Mack Printing Company. 1936. 22.G.251.

British Encyclopaedia of Medical Practice, Including Medicine, Surgery, Obstetrics, Gynaecology and Other Special Subjects. Under the General Editorship of Sir Humphry Rolleston. Vol. 1. Abdominal pain to appendicitis. London: Butterworth & Co. 1936. 6.G.527.

American Pharmaceutical Association. The National Formulary. Official from June 1, 1936. Sixth Edition. Washington, 1935. 22.K.107.

American Medical Association. Council on Pharmacy and Chemistry. A Reprint of the Reports for 1935, with the comments that have appeared in the *Journal*. Chicago, 1935. 22.F.19.

During the summer two floors of stacks have been installed in the new part of the Library. These are

thoroughly modern and to them have been transferred bound periodicals and classes of books for which there is the greatest demand. In connection with these stacks, there are a number of cubicles and studies, which it is hoped members will use in carrying out any research in which they may be engaged. The volumes in these stacks may be taken to the booths by the reader, after being signed for, and kept for periods provided for in the rules, but may not be taken from the building. Holmes Hall attendants will aid in getting books out for this service if it is desired. It is hoped that the opportunity of securing a quiet place to study and of retaining the volumes needed in one's reserved cubicle during the period of their use will be found helpful to a large number of our members. The Director will be glad to make reservations.

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The Library contains a good many items besides books that are of interest, and from time to time there will be found in these columns notice of the most noteworthy. It is perhaps not inappropriate that the first of them to receive notice is the collection of Holmesiana, to which some recent additions have been made. Dr. Oliver Wendell Holmes was the first President of the Library, and the new stacks are largely due to the beneficence of members of his family in commemoration of his interest in the Library.

The main reading room is named Holmes Hall in his honor. Here will be found his bust in bronze and his portrait in oil and a collection of Holmesiana, begun by Dr. James R. Chadwick.

The Library also has the anatomical library of Dr. Holmes, given during his lifetime. In the early days at Boylston Place, the main reading room table was a dining room table given by Dr. Holmes. This is still in use in the new periodical room.

Mr. and Mrs. Edward J. Holmes have given to the Library two easy chairs and a small revolving book case, which were formerly in the study of Dr. Holmes. These very interesting additions to our Holmes mementoes are at present in Holmes Hall.

Dr. Harris P. Mosher, a very good friend of the Library, has made a notable gift to the Holmes collection in the form of a plaque of Dr. Oliver Wendell Holmes, after the famous caricature by "Spy", published in *Vanity Fair*, London, June 19, 1886. Dr. Mosher had his model cast in bronze and has presented it to the Library.

The short biographic sketch by "Jehu, Junior", which accompanied the caricature by "Spy", is reproduced here for those who have not had the pleasure of its perusal.

*Vanity Fair*

(London, June 19, 1886)

Men of the Day—Dr. Oliver Wendell Holmes

"Born seven-and-seventy years ago at Cambridge, Massachusetts, he grew up, took his degree at the age of twenty from Harvard University, and devoted himself to the study of the Law. But after a few months he found that the Law bored him, and he determined to follow Medicine. He, accordingly, came to Europe, walked the Paris Hospitals, took various medical degrees and on his return to his native land, married, became the fashionable Boston doctor, and took to Literature; and, although he has filled for five-and-thirty years, to the great delight of the students and the amazement of his brother Professors, the Chair of Anatomy at Harvard, it is to Literature that he belongs.

"He has written a great many books. His poems are quite harmless and full of common-sense and flippancy. They range from Commemoration Odes to Valentines, and are excellent examples of what poetry ought not to be. His novels are an artistic combination of romance and physiology. They are very fantastic, very imaginative and read like the conversation of a medical student in love. His essays are a sort of Montaigne for families, and can be highly recommended. He is the last of the laughing philosophers, and the author of the wise maxim, "Give me the luxuries of life" and I will "do without its necessaries". His style scintillates with wit, and, when it is at its best, has all the charm of an exploding cracker. His chief quality is his wonderful versatility. When he writes poetry, he is a professor. When he lectures on anatomy, he is a poet. His novels are the note-books of a physician; and his philosophy is the kindly observation of a man of the world, the wisdom of one who has dined well.

"Personally, he is a brisk, dapper little man, very brilliant and very bright-eyed; a Puck without malice, an Ariel with a sense of humor. He is very much loved by all who know him, for he has a wholesome dread of people who impart useful information, and thinks that serious conversation is a form of solemn trifling. Attic wit, Yankee humour, a very large supply of human nature, and an absence of any ambition to be President, have made him the most popular man in America. He has been made much of recently in London Society, and has delighted the Duchesses, for, unlike many Society lions, he has the most genial manners and no mane. On the whole, he is a great success. Though a Bostonian, he is not a prig; though a brilliant conversationalist, he can listen; and though seventy-seven years of age, he is still a very young man."

Dr. Lawrence W. Baker, of the Harvard Dental School, who has produced some fine portrait work in pencil and chalk, has made a delightful study of Dr. Holmes, which has been reproduced. Dr. Baker has given a copy, which he has retouched in pencil and chalk, to the Library for its collection of Holmes pictures.

## MISCELLANY

### PREVALENCE OF INFLUENZA IN EUROPE AND THE UNITED STATES

Under date of January 5, 1937, Dr. F. G. Boudreau, of the Health Section of the League of Nations, informed the Surgeon General of the Public Health

Service that influenza was showing an unusually early seasonal tendency to assume epidemic proportions in Central and Northwestern Europe, especially in Berlin, Copenhagen and London.

Although there has been a slight seasonal increase in the prevalence of influenza in recent weeks, the situation is favorable in all sections of the United States at the present time. For the week ended January 2, 1937, 3,993 cases of influenza were reported to the Public Health Service by the health officers of 41 states, as compared with 1,786 cases for the corresponding week last year. For the week ended December 26, 1936, these states reported 2,088 cases, and for the corresponding week of last year 1,469 cases. The average number of cases reported by the 41 states for the last week of the year during the last 8 years is 29,800. This average, however, includes data for the years 1929 and 1932, when influenza was epidemic at the close of the year.—*Public Health Reports* 52: 54 (Jan. 8) 1937.

## SURGEON GENERAL'S ANNUAL REPORT

Health conditions in the United States have not only been good during the past five years but continue favorable, according to Surgeon General Thomas Parran of the United States Public Health Service in his annual accounting to Congress. The average general death rate from 1931 to 1935, inclusive, was 10.9 per 1,000 population, the lowest rate recorded in the United States for any five-year period, and the rate for 1935 was 10.8 per 1,000.

Dr. Parran points out that new low death rates were recorded for both typhoid fever and diphtheria in 1935 and that the tuberculosis death rate maintained the downward trend that has been one of the outstanding achievements in public health in recent decades. He also states that typhoid fever, extensive outbreaks of which formerly occurred with considerable frequency, has been reduced by modern sanitary procedures until it is no longer a major cause of sickness in this country. A new low death rate for infants under one year of age was also recorded in 1935, but maternal mortality showed no significant decline.

With the decrease in many of the communicable diseases that were previously made the special object of public health efforts, there has been a concomitant increase in deaths from the chronic diseases, such as heart disease and cancer, and the Public Health Service is now devoting increasing attention to the study of these conditions.

Neither cholera nor yellow fever appeared in the United States in the year ending June 30, 1936, but three cases of plague were reported in Western states, where the disease is constantly being encountered in rodents, several new species of which were found to harbor the infection in 1936. A total of nearly 11,000 cases of poliomyelitis was reported in 1935, as compared with 7,500 in 1934, this disease being unusually prevalent in the Eastern regions of the country. Nearly 8,000 cases of smallpox were reported in 1935, an increase of 2,500 over the number for 1934, but a smaller number than for any year prior to 1933. The annual average for the five years preceding 1935 was 20,400.

In order to prevent the importation of disease through commerce, the Public Health Service keeps currently informed of the occurrence of dangerous infections in foreign countries and is on constant guard at our ports of entry for disease that may be brought by vessels and airplanes. As a result of the effectiveness of this sanitary guard at our ports, no quarantinable disease gained entrance during the fiscal year ending June 30, 1936. A case of smallpox was detained at quarantine at Boston, and two cases were detected and refused entry on the Mexican border. During the year quarantine officers of the Public Health Service inspected nearly 16,000 vessels, carrying 733,000 passengers and 1,182,000 seamen, and 2,281 airplanes carrying 31,898 persons; 1,193 of the vessels were fumigated. These officers also examined 824,400 alien passengers and 722,700 alien seamen under the immigration law.

Research in various fields relating to the cause and prevention of disease is an important function of the Public Health Service. These studies are designed to increase the fund of knowledge regarding diseases in order that improved and more effective control measures may be applied. The subjects to which intensive study was devoted included cancer, heart disease, malaria, Rocky Mountain spotted fever, poliomyelitis, leprosy, tularemia, plague and such additional subjects as industrial diseases, nutrition, child hygiene, dental investigations, milk sanitation and stream pollution.

A protective vaccine against Rocky Mountain spotted fever was first prepared by Public Health Service officers about ten years ago. During the fiscal year 1936, the largest quantity of this vaccine ever produced, 530 quarts, enough to vaccinate over 100,000 persons, was prepared at the Public Health Service Rocky Mountain laboratory at Hamilton, Montana.

One of the important results of the study of two vaccines designed for specific immunization against poliomyelitis was the finding that they might, in rare cases, cause the disease, and caution was advised in using them in future human tests until further investigation has been made. The report on these vaccines is believed to be the first publication of a thoroughly controlled study of a specific agent for immunization of the general population.

In 1935 research workers of the Public Health Service discovered that laboratory animals treated intranasally with sodium aluminum sulfate solution were rendered resistant to subsequent nasal instillation of poliomyelitis virus. In 1936 these investigators found that picric acid, alone or in combination with sodium aluminum sulfate, also has this preventive property and that this action is effective under laboratory conditions against both poliomyelitis and epidemic encephalitis. These discoveries may prove to be of importance in control-

ling the diseases in man, but their practical value under natural conditions remains to be determined.

A phase of public health that is receiving emphasis under the new Surgeon General is that relating to the venereal diseases. A much greater activity by both federal and state health services in the prevention of these diseases is foreseen by Surgeon General Parran. That this attitude is fully justified is readily understood when we consider that syphilis alone ranks with cancer, tuberculosis and pneumonia as a leading cause of death. The Surgeon General says, "When these diseases are brought out into the open, freed from the medieval concept of condign punishment for moral transgressions, and are dealt with as any other highly communicable diseases, the way is open to eradicate them just as we have stamped out other dangerous infections."—*U. S. Public Health Service.*

## DR. NORTON APPOINTED MEDICAL ADVISER

Dr. Matthew V. Norton, of Jamaica Plain, has been chosen medical adviser by the Industrial Accident Board to succeed the late Dr. Francis D. Donoghue.

Educated at Boston College and Tufts College, he was graduated from Tufts College Medical School in 1929. He is a member of the surgical staffs of the Carney and St. Elizabeth's Hospitals in Boston and the J. B. Thomas Hospital in Peabody.

For the past three years Dr. Norton has served as impartial examiner for the Board.

## CONNECTICUT NEWS

### Welfare Foundation, Inc.

A foundation designed to promote nonsectarian charitable and social welfare projects "on the broadest possible scale" has been founded by a Hartford business man, whose identity is undisclosed. Purposes of the foundation, as revealed in the articles of association, include furthering and developing of charitable, benevolent, hospital, infirmary, literary, research or religious work, assistance of worthy, talented, industrious and needy young men and women selected by the trustees, provision of medical and surgical care for the aged, sick or infirm, cooperation with existing charitable agencies and the giving and lending of money to worthy and needy persons.

### Water Supply Control

State Health Commissioner Osborn recently met in conference the county health officers of Connecticut to discuss a reciprocal measure under which this State would protect the sanitation of Massachusetts water supplies rising in Connecticut. Massachusetts has already put into effect its share of the reciprocal plan. A bill will be presented to the General Assembly carrying out the reciprocal idea.

### Old Age Assistance to Private Hospital Patients

The Deputy Attorney General, in an opinion handed down to the Welfare Commission, has ruled that patients in private hospitals may receive old age assistance awards. The ruling states that private hospitals not receiving State aid and not tax exempt, but operated for profit, are not "institutions" within the meaning of the Old Age Assistance Act and that old age assistance recipients may be admitted to them and continue to receive their awards even though a town or city supplements the award to meet the cost of hospital care. This decision affects about 75 State-licensed private hospitals and is a reversal of the position taken by the bureau, on advice given by the attorney general's office, when the law was first in effect.

### State Department of Health

Dr. Franklin M. Foote, of Elizabethton, Tennessee, has been appointed chief of the division of local health administration of the State Department of Health. Dr. Foote replaces Dr. Benjamin G. Horning, who recently became health officer of Hartford. Dr. Martha O'Malley, of Iowa, has been appointed a member of the Bureau of Child Hygiene in the same department. Dr. Foote was graduated from Yale University in 1930, from the School of Medicine in 1933 and from the School of Public Health in 1935. He secured his hospital experience at the United States Marine Hospital, Norfolk, Virginia, and has been engaged in public health work in Tennessee. Dr. O'Malley comes from general practice in Iowa, having graduated from Iowa State University College of Medicine and secured hospital training at the Chicago Maternity Center and the Children's Hospital of Chicago.

The State Department of Health, through Commissioner Osborn, has requested the immediate construction of a building to house its various bureaus. This is not the first time this request has been made, but it is more urgent this year in view of the proposed plans of the Reorganization Commission. Dr. Osborn has also asked for the creation of a new position, that of an additional engineer in the Bureau of Sanitary Engineering to act as a special adviser to local health officers, zoning boards and planning boards on housing. The Commissioner further states that more lives could be saved if a full-time physician were employed on the problem of serum treatment of lobar pneumonia. An additional physician is also needed in the Bureau of Preventable Diseases to investigate cases of disease, such as infantile paralysis, and to aid in the prevention of tuberculosis.

### Hartford Board of Health

Dr. Paul S. Phelps, of Hartford, has been appointed director of the Bureau of Tuberculosis. Dr. Phelps is a graduate of McGill University, Faculty of Medicine, the Royal Victoria Hospital in Montreal and the Danbury Hospital. He has been engaged in tuberculosis work at Gaylord Farm Sanatorium, Wallingford, and at the Henry Phipps Institute. For eighteen months Dr. Phelps was resident physician and acting director of the Colfax School of Tuberculosis.

Dr. Charles C. Wilson, director of physical and health education in Hartford schools, has been invited to participate in a survey of the physical education and health activities of schools in the State of New York. This survey is a part of the study of character and cost of education being made by a committee appointed by the New York Board of Regents. Dr. C.-E. A. Winslow, of the Yale University School of Medicine, is also a member of this board.

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Dr. Philip J. Moorad of New Britain, by a decision rendered in the Court of Common Pleas, was ordered to cut his bill for professional services practically in half. In rendering his decision the judge said, "I have serious doubts that she (the defendant) ever dreamed that she was being attended by a psychiatrist. To her all doctors are alike."

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Dr. Thornton E. Vail, of Thompsonville, entertained hundreds of children, at whose arrival into the world he presided, at a Christmas party on December 23. Children between one and six years of age with their mothers were invited to attend. Each child received a gift.

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Dr. Dwight J. Bernstein, of Hartford, assistant police surgeon, has been appointed a resident physician at the New York Foundling Hospital for one year. His duties began January 1, 1937.

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The Hartford Hospital is planning alterations on its Woman's Building whereby additional maternity beds will be provided on the floor now used for outpatient clinics. The latter will be transferred to another part of the hospital.

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**BROWN**—Kent Oakley Brown, M.D., aged 66 years, chairman of the rating board of the Veterans Administration at Newington, died suddenly of cardiac disease on December 8. Born June 21, 1870, in Oxford, Ohio, he attended Washburn College and Kansas Medical College, graduating in 1902. In 1904, Dr. Brown became house physician at the Essex Union General and Emergency Hospital in Salem, Mass., and was assistant physician at Walnut Lodge Hospital, Hartford, a sanitarium, from 1905 to 1911. In 1918, Dr. Brown was appointed assistant physician at the emergency hospital of the Winchester Repeating Arms Company, New Haven, and remained in that capacity through 1920. During 1921 he attended the Yale Clinic. After being associated with the Veterans Bureau in Washington, as referee, he was transferred in 1922 to the New York office, and, in 1924, with the opening of the Veterans Administration in Hartford, he became chairman. In 1930 he went to Newington.

A senior elder of the First Presbyterian Church, Dr. Brown had served as general superintendent of the Sunday School. He was a member of the Hartford County Medical Association and the American Medical Association. Dr. Brown leaves his widow, Margaret Eliza (Lewis) Brown; a brother, Dr. Newton Brown, of Wisconsin; a nephew and a niece.

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**MORGAN**—William Denison Morgan, M.D., aged 86 years, medical director of the Phoenix Mutual Life Insurance Company, died December 17 in Hartford. Dr. Morgan's first association with the Phoenix Mutual was in 1892, when he was appointed an examiner and substitute member of the Medical Department. In 1895, he became a regular member of the department, and a few years later was appointed assistant medical director. Dr. Morgan was appointed medical director in 1906 and held that position until his death.

A graduate of Trinity College in 1872, he attended the College of Physicians and Surgeons at Columbia University, where he was graduated in the class of 1876. He spent a year in postgraduate research at the University of Leipsig, Germany. Dr. Morgan served his internship at New Haven Hospital and was with various New York clinics until 1878, when he began general practice in Hartford. Dr. Morgan played a leading part in the growth and development of the Hartford Hospital. He served on the board of trustees and was chairman of the executive committee for almost thirty years, retiring in 1932. At the time of his retirement, Dr. Morgan was named honorary chairman of the executive committee. For many years he served as physician for the Orphan Asylum and the Church Home in Hartford and was a trustee of the Connecticut Hospital for the Insane at Middletown for ten years. A former president of the Hartford Club, Dr. Morgan was a charter member of the Farmington Country Club and a member of the IKA Society, now the Iota Kappa Alpha Fraternity, also the Union League Club of New York City and Hatchett's Reef Club. Dr. Morgan was also a trustee of the Society for Savings.

Born November 20, 1850, in Hartford, he was a son of the late Henry Kirke Morgan and Emily Malbone (Brinley) Morgan and was a direct lineal descendant of one of the old Colonial families of Connecticut, the family having been prominent in the community of New London almost from its earliest days of settlement. His early education was received at the Hartford public schools, the Hopkins Grammar School, New Haven, the Episcopal Academy, Cheshire, and St. Paul's School, Concord, N. H. His extensive classical knowledge was supplemented by instruction from private tutors, but when he applied for admittance to Trinity College, he was not allowed to matriculate, being about a year younger than the minimum age fixed by the college for entrance to the institution. He was then sent to St. Paul's School, Concord, N. H., and, owing to ill health, joined his uncle, George D. Morgan, who was traveling in Europe. For some time he was thus engaged, visiting all parts of the Continent. He married Gabriella Sengstak on August 15, 1913. He also leaves a daughter, Gabriella Denison Morgan.

The editor of the *Hartford Courant*, referring to "Uncle Billy," as Dr. Morgan was known to his friends, writes the following:

"Kind and charitable, he fitted well Voltaire's definition of a physician as an estimable man, 'who having studied nature from his youth, knows the properties of the human body, the diseases which assail it, the remedies which will benefit it, exercises his art with caution and pays equal attention to the rich and poor'. A familiar figure at the Hartford Club, where in his later years he lived, his jovial nature found abundant expression. No matter what turn the conversation might take, the topic always seemed familiar to him. His love of the classics had given him a rich background. He had read about everything worth reading, and he followed current events, especially in the field of politics and economics, with a full understanding of their significance. He had a keen and penetrating mind, tempered with an appreciation of humor that made his company eagerly sought. Age did not dim his eye or diminish his enjoyment of life. If ever a man possessed the art of growing old gracefully and belying his years, it was Dr. Morgan, and many there will be to mourn him."

## SUMMARY OF MORTALITY FROM AUTOMOBILE ACCIDENTS

### Annual Summary for 1936

A total of 9,599 automobile fatalities occurred during 1936 in 131 major cities, according to reports made public by Director William L. Austin of the Bureau of the Census, Department of Commerce. The 1936 total was 178 fewer than the 9,777 reported for 1935. During the first half of 1936, fatalities were notably below the previous year, but in the late months of 1936 the toll rose rapidly, somewhat above 1935.

During 1936, fatalities due to accidents in the city were reduced below the 1935 figure in 63 of the 131 reporting cities. The total rose in 57 cities, and in 11 municipalities automobile-accident deaths were exactly the same in 1936 as in the previous year.

Fatalities were reduced in New York and Chicago, the two largest cities in the country. New York had 138 fewer deaths in 1936 than in 1935, and decreased its fatal automobile accidents by 12.9 per cent. Chicago reported an 8.8 per cent decrease, with 68 fewer deaths. Among other major cities reporting, percentage decreases in 1936 were Baltimore, 12.8 per cent; Boston, 6.9 per cent; Camden, 43.3 per cent; Dallas, 15.1 per cent; Des Moines, 48.7 per cent; Newark, 17.0 per cent; New Orleans, 30.5 per cent; Omaha, 59.5 per cent; St. Louis, 38.9 per cent, and Worcester, 28.6 per cent.

San Francisco reported 50.0 per cent more automobile fatalities in 1936 than in the previous year. In this city there were 90 deaths in 1936, and 60 in 1935. Among other large cities reporting percentage increases in 1936 over the previous year were Albany, 23.8 per cent; Birmingham, 28.6 per cent; Detroit, 19.0 per cent; Milwaukee, 19.6 per cent; Philadelphia, 13.5 per cent; Pittsburgh, 4.1 per cent, and Wilmington, 36.4 per cent.

The data given for both years are provisional figures. Due to different methods of collection, the provisional figures may differ from the final figures for some cities, but valid comparisons may be made between the provisional figures for 1936 and those for 1935.

## THE CENTENNIAL OF THE UNIVERSITY OF LOUISVILLE MEDICAL SCHOOL

The University of Louisville Medical School is the second oldest medical school now in existence west of the Alleghenies and the oldest municipal medical college in the United States. It celebrates its Centennial March 31 to April 3, 1937, at Louisville, Kentucky.

The alumni are urged to make their plans now to participate in the celebrations. There will be an unexcelled clinical program by outstanding guest speakers. Ward rounds will be held daily at the hospital and lectures in the forenoon and afternoon. There will be numerous scientific exhibits in the various departments of the university. For the visiting ladies unusually interesting entertainment will be provided, including motor trips through the beautiful local parks and to the famous bluegrass region. The historic Old Kentucky Home at Bardstown and Lincoln Memorial at Hodgenville are also included in the itinerary. Mammoth Cave is within easy motoring distance for those who wish to visit this natural wonder. Lexington and the famous race horse stables are but a short distance from Louisville in the heart of the bluegrass region.

The alumni will shortly receive advance notices and printed programs of the Centennial celebrations. They are urged to make their plans now to attend.

# CORRESPONDENCE

## FIRST CYSTOSCOPY IN NEW ENGLAND

January 11, 1937.

Editor, *New England Journal of Medicine*,

The recent death of Dr. Edward Reynolds reminds me that he was probably the first physician in New England to see the interior of the living human bladder by cystoscopic method. The word, cystoscope, had not been devised at that time.

It occurred early in January, 1895. Dr. Reynolds was doing outpatient gynecologic work at the Boston City Hospital. A female patient was placed in knee-chest position, and a pledget of cotton, saturated with a cocaine solution, was inserted into the meatus and urethra.

A very small, infant rectal speculum was inserted, the plunger removed and the air permitted to enter and balloon the bladder. Light was reflected from an ordinary head mirror. There was no electricity at that time. Gas light was too unsteady. Flashlights were unknown. So he brought an old-fashioned "bull's eye" or dark lantern with a

sliding front or shutter. An assistant held the "bull's eye" focussed on the head mirror, while Dr. Reynolds peered through the little speculum.

When he saw the urine flowing from the ureters, he was as excited and elated as though he had discovered the veritable Fountain of Youth. The next day he had two small catheters, which he succeeded in passing into the ureters and so obtained separate specimens of urine.

The head nurse at the time, I believe, was a Miss Creighton, and his assistants were William Northend Tenney, Henry Delano Kennard and one of the Dudleys — I cannot recall whether William or Charles. I am not sure which of the assistants were present at that first attempt, though I am fairly certain that Tenney was chief assistant. *I held the light.*

It was during the first or second week of January, 1895. I am positive to that extent and I am sure that it was the first time that the living human bladder had been "cystoscoped" in New England.

I believe that it had been done for the first time in New York, Philadelphia or Baltimore during the previous December.

The science of cystoscopy has grown from that small, crude beginning—an infant rectal speculum, a common head mirror and a "bull's eye" lantern.

In the following weeks Dr. Reynolds had many interested visitors from near-by, and I recall visitors from Portland and Bangor.

The incident may be of historical interest — the first cystoscopy in New England.

Yours truly,

FRANK T. WOODBURY,
Harvard Medical School, '96.

21 Chestnut Street,
Wakefield, Mass.

## RECENT DEATHS

**BUCK**—HOWARD MENDENHALL BUCK, M.D., of 465 Park Drive, Boston, died at his home, January 11, after a long illness. He was in his eighty-first year.

Dr. Buck received his early education in Boston private schools, and was graduated from Harvard College in 1878. He received his M.D. degree from the Harvard Medical School in 1882.

After his retirement from active practice several years ago, Dr. Buck devoted his time to historical and genealogical work. He was a retired member of the Massachusetts Medical Society.

**NASH**—FRANCIS JOSEPH NASH, M.D., of 21 Richwood Street, West Roxbury, Massachusetts, died at his home, January 11, in his forty-second year.

Born in Westboro, Dr. Nash attended Westboro High School and was graduated from Tufts College Medical School in 1919. He was a member of the visiting staffs of several Boston hospitals.

He was a Fellow of the Massachusetts Medical Society and a member of the American Medical Association and the Knights of Columbus.

His widow, Mrs. Geraldine S. Nash, his father, one sister and one brother survive him.

**deKRAFT**—FREDERIC DEKRAFT, M.D., one of the first to treat disease and injuries by diathermy, died on December 25, 1936, at his home in New York City. He was seventy-five years of age.

Born in Germany, where he received his preliminary education, he came to this country and was graduated from the Jefferson Medical College of Philadelphia.

Dr. deKraft was associated with a large number of medical organizations and honored by several for his work in the development of a number of medical instruments, many of which bear his name.

In 1928 he was elected to honorary fellowship in the Academy of Physical Medicine, and in 1932 he was cited by the American Congress of Physical Therapy for outstanding work in the development of diathermy apparatus.

## NOTICES

### CLINICS FOR CRIPPLED CHILDREN IN MASSACHUSETTS, UNDER THE PROVISIONS OF THE SOCIAL SECURITY ACT

Clinic Date Orthopedic Consultant
Lowell—January 30—Dr. W. Russell MacAusland.
Hyannis—January 26—Dr. Paul Morton.
Fall River—January 25—Dr. Eugene McCarthy.

### MEDICAL CLINIC AT THE PETER BENT BRIGHAM HOSPITAL

At 3:30 p. m. on Thursday, January 28, in the Amphitheater of the Peter Bent Brigham Hospital, Dr. Donald J. MacPherson, Instructor in Neuropathology, Harvard Medical School and Associate in Medicine, Peter Bent Brigham Hospital, will give a medical clinic. To it are cordially invited practitioners and medical students.

## REPORTS AND NOTICES OF MEETINGS

### THE NEW ENGLAND HEART ASSOCIATION

The monthly clinical meeting of the New England Heart Association was held at the Peter Bent Brigham Hospital on January 11. Dr. Samuel A. Levine presided.

The first paper consisted of a presentation of "Three Clinical Case Records with Pathological Findings" by Dr. Levine.

*Case 1.* This patient illustrated how well one can do with rheumatic valvular disease. He had had rheumatic fever at the age of 17, when his heart became involved. At that time he was cautioned not to exercise much, but despite this he played tennis to the age of 60 and lived a normal life until about 1 year before he died. He finally succumbed to heart failure at the age of 72. He had a great many at-

tacks of Adams-Stokes' syncope for some months in 1926. He had calcified mitral and aortic stenosis, which diagnoses were confirmed at autopsy. He also was known to have had hypertension, auricular fibrillation and right bundle branch block for at least 10 years. (Pathological specimen demonstrated.)

*Case 2.* This woman, 56 years old, had had rheumatic fever at the ages of 17 and 45. She carried on normal duties, although she always had a heart murmur. On November 4, 1935, she had a severe chill and pain in the right chest. She presented a typical picture of right-sided lobar pneumonia. The fever subsided after a week, but later this began to swing, suggesting empyema. The blood culture was positive for pneumococci. Because of the prominent, apical systolic murmur and a questionable embolus to the right arm, the diagnosis of acute pneumococcus endocarditis of the mitral valve was made, which was confirmed at autopsy, December 17, 1935. The valve showed an old rheumatic endocarditis with superimposed acute bacterial vegetations. (Pathological specimen demonstrated.)

*Case 3.* A man, 48 years old, previously well, developed acute neisserian urethritis in April, 1936. He was under constant treatment for this, although he remained at work. He later developed prostatitis and swelling of the left testicle. In June he had chills and felt feverish. When first seen on July 21, 1936, examination of the heart was entirely negative. The temperature swung from 99° to 103°F., and the diagnoses of gonococcus septicemia and epididymitis were made. These were confirmed by a positive complement fixation test and a positive blood culture. Hyperpyrexia treatment in a hot box was instituted. He received five treatments at a temperature of 106°F. but, despite this, an aortic diastolic murmur developed and he died on August 13, 1936. Postmortem examination confirmed the diagnosis of acute gonococcus endocarditis, engrafted on a previously normal aortic valve. (Pathological specimen demonstrated.)

Dr. A. W. Contratto gave the second paper on the program which was entitled, "Electrocardiographic Study of Lead IV, Using Nine Chest Leads."

In an attempt to find the optimal position from which to take the precordial lead in the electrocardiographic study of coronary infarction, tracings were taken from nine positions over the anterior chest. The positions were midsternum 2nd interspace (lead IV-1), 4 cm. to the left of this point (lead IV-2), midsternum 3rd to 4th interspace (lead IV-3), 4 cm. to left of this point (lead IV-4), 8 cm. to left of midsternum at this level (lead IV-5), 6th interspace 4 cm. to the right of the midsternum (lead IV-6), midsternum same level (lead IV-7), 4 cm. to left (lead IV-8) and 10 cm. to left of the midsternum in the 6th interspace (lead IV-9).

Fifteen male house officers and 2 young women, all with clinically normal hearts, together with five ward cases, eventually shown by autopsy to have died from causes other than heart disease, were used as controls. The Q wave was present in all the cases in every position except in 2, in which it was absent in lead IV-6 and very small in leads IV-3 and IV-4. The Q wave was present and most pronounced in the IV-9 lead. The T wave was upright in lead IV-6 in 90 per cent, and in leads IV-1, IV-2, and IV-3 in 70 per cent.

Eighty-eight tracings on 60 patients that had or were suspected of having had myocardial infarction were taken. In all except 2, when the Q wave was absent at the IV-9 position it was absent in all other leads. In these 2 cases the Q wave was absent before chest tap, and after the removal of fluid from the left chest the Q wave was present.

All 7 cases that came to autopsy and in which the Q wave was absent in lead IV-9 had an anterior infarction. Some cases were encountered in which the Q wave was absent in all chest leads except IV-9; unfortunately none of these cases were autopsied. However, in previous work done by S. A. Levine and H. D. Levine, in which the Q wave was absent in the left sternal border lead and present at the apex, autopsy showed no infarction in many cases.

Although a great deal more work is necessary before definite conclusions can be reached, the optimal position appears to be the region of the apex impulse.

The next paper was by Dr. Maurice A. Schnitker on "Electrocardiographic Studies of Autopsied Cases of Congenital Heart Disease."

In a review of 1,600 cases of congenital heart disease in the literature since 1915, 62 instances with autopsy were found in which the electrocardiogram was reproduced. From three Boston hospitals 24 additional cases were obtained, making a total of 86 autopsied cases with electrocardiograms. The tracings were photographed and divided into acyanotic, tardive cyanotic and cyanotic groups. The separate entities were classified according to the major lesion present. These included heart block, 7 cases; idiopathic hypertrophy, 4 cases; coarctation of aorta, 3 cases; dextrocardia, 6 cases; bicuspid aortic valves, 6 cases; patent ductus arteriosus, 4 cases; interatrial septum defect and foramen ovale, 16 cases; interventricular septum defect, 12 cases; pulmonary stenosis, 3 cases; pulmonary stenosis and ventricular septum defect, 6 cases; tetralogy of Fallot, 15 cases; tetralogy of Eisenmenger and transposition of great vessels, each 2 cases. The electrocardiograms of each group were illustrated and discussed. From the study so far, it is felt that the electrocardiogram may be helpful in the diagnosis of some cases of congenital heart disease.

Dr. C. Sidney Burwell reported on "Studies on Venous Pressure."

His paper dealt with the utility of venous pressure measurements when comparable determina-

tions are made in different parts of the body, particularly when the arm vein pressure and the femoral vein pressure are compared. Comparisons of the pressure in these areas were made in normal persons, in individuals with cardiovascular disease but without heart failure, in patients with heart failure with and without ascites, and in patients with pericardial obstruction due to fluid or to fibrosis, and it was found that certain generalizations could be made. In normal people arm and leg pressures are similar under the conditions described. In patients with heart failure without ascites the venous pressure is elevated, but the arm and leg pressures are not essentially different. The same is true of patients with pericardial obstruction. The accumulation of ascites is accompanied by an increased pressure in the leg venous pressure.

The last paper was by Dr. J. Allen Kennedy on "The Circulatory Adjustments in Arteriovenous Fistula."

Observations on the circulation of a young man of 19, who had an arteriovenous fistula of considerable size in his forearm, were presented. These observations included heart rate, carotid sinus pressure, arterial blood pressure, venous blood pressure, circulation time, arm volumes, and oxygen content of arterial blood and venous blood drawn from various parts of the body for comparison with that of venous blood near the fistula. Data on the blood volume and output of the heart were of considerable interest because they added confirmatory evidence to facts observed in experimental animals but not well established in human beings. Measurements were made of the time required for circulation of blood through the fistula, that is, for blood to leave the lung capillaries, pass through the fistulous opening and return to the lung capillaries. These measurements were presented as evidence that the three-sample-acetylene method of Grollman for measuring the cardiac output was valid as applied to this case.

The work of the heart was calculated from the data presented by using the Evans formula, and it was shown that under basal conditions the presence of the fistula caused the heart to perform 28 per cent more work.

Observations were also made on patients with pelvic tumors and with mediastinal tumors, and it was observed that such neoplasms may obstruct the venous return and lead to local elevation of the venous pressure. It is under such circumstances, that is, of elevated venous pressure in one part of the body, that collateral circulation develops. When pregnant women were observed it was found that there was an elevated venous pressure in the leg from about the third month onward.

Certain studies in arteriovenous fistula were reported to point out the effect of increased inflow into a venous channel.

The application of these observations to the diagnosis of disease was discussed.

## WEST ROXBURY MEDICAL ASSOCIATION

The West Roxbury Medical Association held its annual legislative meeting at the Faulkner Hospital on January 5. Dr. Franklin G. Balch, president of the association, presided. The principal speaker was Dr. Charles E. Mongan, president of the Massachusetts Medical Society, who talked on health insurance. Other speakers were Mr. Ingersoll Bowditch, treasurer of the hospital; Dr. John S. H. Leard of West Roxbury; and Dr. Alexander S. Begg, secretary of the Massachusetts Medical Society.

## NEW ENGLAND OBSTETRICAL AND GYNECOLOGICAL SOCIETY

At the annual meeting of the New England Obstetrical and Gynecological Society, which was held in Boston, on December 2, 1936, it was voted by the Society to give a prize of $250 for the best essay on either obstetrics or gynecology.

The doctors eligible to compete for this prize are interns from any hospital in New England that has an obstetric service. The members of the Executive Committee of the Society are to act as the judges, and the prize will be awarded annually.

It was also voted to accept the invitation to take part in the International Congress for Obstetrics and Gynecology, which is to be held in Amsterdam, Holland, on May 4-8, 1938.

## AMERICAN PSYCHOANALYTIC ASSOCIATION

At the annual meeting of the American Psychoanalytic Association held in New York on December 28 and 29, 1936, the following officers were elected:

Isador H. Coriat, M.D., Boston, Mass., President; Adolph Stern, M.D., New York City, Vice-President; Lewis B. Hill, M.D., Baltimore, Maryland, Secretary; Thomas M. French, M.D., Chicago, Illinois, Treasurer.

## THE FAULKNER HOSPITAL

The usual monthly clinical meeting was held at The Faulkner Hospital on Thursday, January 7, at 5:00 p. m.

The first case under discussion was that of a woman, 26 years of age, who came into the hospital complaining of pain in the back and legs for approximately 2 months. There was nothing of importance in the family history and in the past history there was only the story of swollen cervical glands, which had been removed in childhood, and symptoms suggesting eclampsia at the time her baby was born 10 months before. Moreover, a check on the blood pressure and the kidneys had shown no abnormalities in either a short time before the symptoms of the present illness assumed important proportions. For 3 weeks before admission she had been confined to her bed, had lost an appreciable amount of weight, and was having sweats several times at night and enough pain to keep her awake a good deal of the time. Shortly before

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admission to the hospital numerous black and blue spots developed on the skin, and there was bleeding from the gums. On entrance to the hospital it was found that she was running a fever and had a rapid pulse rate. The teeth were in poor condition, and the gums were bleeding. There was a blowing systolic murmur over the precordia, and there was pain on movement of the extremities. There were ecchymotic and purpuric spots in the skin. The urine showed some albumin and casts but no Bence-Jones protein. The blood Hinton reaction was negative. The stools showed occult blood. The white cell count was 5,200, the red cell count 3,920,000, and the stained specimen of the blood was not remarkable. The sedimentation rate was increased and x-ray pictures of the bony structures showed involvement of the bones of the spine, pelvis and upper femora and humeri, due either to leukemia or to rapidly progressing metastatic malignancy.

During the 3 weeks of her stay in the hospital the white blood cell count shifted from 5,200 to 21,300 and the red count from 3,920,000 to 1,540,000, and myelocytes began to appear in the stained specimen. There were no sickle cells. The bleeding from the mucous membranes and into the skin continued. The diagnosis of aleukemic leukemia was made.

At autopsy the retroperitoneal glandular tissue was markedly increased in size, suggesting tumor formation, which was supposed to be due to myeloid cells. There were areas in the liver and spleen suggesting tumor and suggesting the taking over of the function of the blood-forming organs. The bones were soft, and the bone marrow was abnormal in appearance. It was thought, at the time of the autopsy, that the diagnosis of aleukemic leukemia was correct, and only when the microscopic tissue came through was it discovered that the disease was a carcinoma that had infiltrated practically all the organs of the body, especially the bone marrow and the bones themselves. The result was that the blood-forming function had been destroyed in the bone marrow and was being taken up in the liver and spleen. Just where the carcinoma originated has not as yet been discovered, although a most careful search has been made for the original site. Unfortunately, permission to open the head at the autopsy was not granted.

The second case was that of a boy, 20 years of age, who entered the hospital with fever and convulsions. The family history and past history were of no importance. The patient was reported as having had a cold for a week with a temperature at one time of 104°F., but he had been able to keep at his work. He had coughed during the nights before entrance. The day before entrance, while at work, he had had a convulsion. He was brought home, collapsed on arrival and became unconscious. He had had further convulsions and, at times, was irrational. Except for the repeated convulsions and signs pointing toward the central nervous system, which might well have been due to the effects of the convulsions, nothing of importance was found on physical examination. There were a few pustules on the extremities. He had a fever of about 102.5°F. The pulse rate was 115 and respirations 35. The urine showed albumin and casts. The white blood cell count was 11,950. There was no anemia. The stools were negative except for occult blood. A blood culture was negative. The blood Hinton reaction was negative. The spinal fluid on the day of admission was entirely negative and two days later showed a slight increase in cells. The differential diagnosis on admission rested between meningitis, encephalitis and some overwhelming infection. The examination of the spinal fluid ruled out meningitis. The lack of appreciable leukocytosis and the negative blood culture suggested that there was not an overwhelming infection, and it was thought that encephalitis was probably the correct diagnosis.

At autopsy there was marked congestion and edema of the brain and some bronchopneumonia. A positive *Streptococcus hemolyticus* culture was obtained from the lungs, but a culture from the heart's blood was negative.

It was felt that the condition of both the brain and the lungs might have been the result, rather than the cause, of the repeated convulsions. Histologic study of the brain has not revealed, as yet, any evidence of encephalitis and, therefore, unless this was an overwhelming infection with *Streptococcus hemolyticus*, the nature of the disease is not clear. Certainly, the repeated convulsions do not fit in with the usual picture of a severe infection involving the lungs.

Following the presentation of these two cases, Dr. Herbert L. Johnson presented the work that he has done in the preparation of a membrane to be used to prevent adhesions in serous cavities and in the preparation of a new type of suture material. This has, in part, consisted in preparing a membrane from the amniotic sac of a cow and from the allantoic membrane of the same animal. The more recent work has been with the allantoic membrane, since it seems to be just as tough as the amniotic membrane and less vascular. He showed samples of this membrane, which, after being properly cured, can be applied to serous surfaces or wrapped around tissues, such as tendons, in order to avoid the development of adhesions. His experimental work has been done chiefly on rabbits, and the results suggest that the membrane will be a distinct step in advance in this type of work. The reaction to this membrane in comparison with that to catgut has been studied in muscle tissue, and it has been found that the reaction is less severe and the absorption more satisfactory.

Dr. Johnson then worked with this membrane from the point of view of its strength for suture material and, although, up to the present time, the work has consisted chiefly in studying its strength after being prepared for a suture by a simple

twisting rather than the usual way of preparing suture material, it has been found that even with this disadvantage it has more strength than catgut. Studies on the development of this membrane as a suture material are being made at Northwestern University in Chicago and by Dr. Charles F. McKhann of the Children's Hospital in Boston, and at both of these institutions results confirmatory to Dr. Johnson's findings have been obtained. The possibility that this membrane will furnish material for sutures and for tissue to avoid adhesions, which are more satisfactory than existing ones, seems likely.

## THE MIDDLESEX SOUTH DISTRICT MEDICAL SOCIETY

A meeting of this Society will be held at the Hotel Continental, Cambridge, on Wednesday, January 27, 1937.

PROGRAM

Luncheon: 12 noon.

Speaker: Charles H. Lawrence, M.D., F.A.C.P., will deliver a paper entitled, "The Endocrine Treatment of Adolescent and Menopausal Disturbances." His talk will be demonstrated by lantern slides.

Dr. Lawrence is an instructor in the Department of Medicine at the Tufts College Medical School. He is a member of the Society for the Study of Internal Secretions and of the Staff of The New England Medical Center, where he is in charge of the Endocrine Clinic.

After the lecture, the meeting will be open for discussion.

SUMNER H. REMICK, M.D., *President*,
ALEXANDER A. LEVI, M.D., *Secretary*.

## SUFFOLK DISTRICT MEDICAL SOCIETY

IN CONJUNCTION WITH THE BOSTON MEDICAL LIBRARY
8 Fenway
Wednesday, January 27, at 8:15 p. m.
At the Boston Medical Library

Committee Report—Dr. Channing Frothingham.

"A Feasible Plan for Aiding the Collection of Medical and Hospital Fees in Automobile Accident Cases."

"What Is a Nordic?" Dr. Carleton S. Coon, of the Department of Anthropology, Harvard University.

Refreshments!

CHARLES C. LUND, M.D., *Secretary*.

## THE TRUDEAU SOCIETY

An all day meeting of the Trudeau Society will take place Thursday, January 28.

PROGRAM

8 a. m.-12 noon—Operative clinics at the Massachusetts General Hospital — by Dr. Edward D. Churchill; Peter Bent Brigham Hospital — by Dr. Harlan Newton; Deaconess Hospital — by Dr. Richard H. Overholt.

2 p. m.-4 p. m.—Round table discussion, led by Dr. George G. Ornstein at the Norfolk County Sanatorium, South Braintree, Massachusetts.

8:15 p. m.—Beth Israel Hospital Auditorium. Dr. George G. Ornstein of The Seaview Hospital, New York, will speak on "The Pathogenesis of Pulmonary Tuberculosis." Discussion will be opened by Drs. Donald King and Paul Dufault.

MOSES J. STONE, M.D., *Secretary*.

## THE NORFOLK DISTRICT MEDICAL SOCIETY

A regular meeting of the Society will be held in the Hotel Kenmore, Boston, February 16, 1937, at 8 p. m. Telephone Kenmore 2770. Please note that the date of meeting has been advanced from the last Tuesday of the month.

Business: 8 p. m.

Communication: 8:15 p. m. Female Sex Hormonology. Dr. Joe V. Meigs.

Discussion.

Collation.

FRANK S. CRUICKSHANK, M.D., *Secretary*.
1247 Beacon Street,
Brookline, Mass.

## HARVARD MEDICAL SOCIETY

The next meeting of the Harvard Medical Society will be held in the Peter Bent Brigham Hospital Amphitheater (Shattuck Street Entrance), Tuesday evening, January 26, at 8:15 p. m.

PROGRAM

Presentation of Cases.

"Spontaneous Interstitial Emphysema of the Lungs," by Louis Hamman, M.D., Baltimore, Maryland.

Medical students and physicians are cordially invited to attend.

MARSHALL N. FULTON, M.D., *Secretary*.

## MASSACHUSETTS PUBLIC HEALTH ASSOCIATION

The annual meeting will be held on January 28, at the University Club, Boston. Section meetings at 11 o'clock; luncheon meeting at 1 o'clock at which Assistant Surgeon General U. S. Public Health Service, Dr. Warren F. Draper, will speak on the "Federal Program of Syphilis Control."

## SOCIETY MEETINGS, CONGRESSES AND CONFERENCES

### CALENDAR OF BOSTON DISTRICT FOR THE WEEK BEGINNING MONDAY, JANUARY 25, 1937

**Tuesday, January 26—**

*9 a. m. - 10 a. m. Boston Dispensary, 25 Bennet Street, Boston. X-Ray Demonstration. Dr. Alice Ettinger.

9:30 a. m. Massachusetts General Hospital. Thoracic Clinic. Ether Dome.

*8:15 p. m. Harvard Medical Society. Peter Bent Brigham Hospital Amphitheater (Shattuck Street Entrance).

**Wednesday, January 27—**

*9 a. m. - 10 a. m. Boston Dispensary, 25 Bennet Street, Boston. Hospital Case Presentation. Dr. S. J. Thannhauser.

†12 m. Clinicopathological Conference. Children's Hospital Amphitheater.

2 p. m. Massachusetts General Hospital. Psychiatric Clinic, Outpatient Department.

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4 p. m. - 5 p. m. Surgical Pathological Conference. Dr. Cutler and Dr. Wolbach, Peter Bent Brigham Hospital.

8:15 p. m. Suffolk District Medical Society. Boston Medical Library, 8 Fenway.

**Thursday, January 28—**

8 a. m. Trudeau Society. Operative Clinics, Massachusetts General Hospital.

*8:30 - 9:30 a. m. Exchange visit, Surgical and Orthopedic Staffs of the Peter Bent Brigham and the Children's Hospitals, held this week at the Children's Hospital.

9 a. m. Massachusetts General Hospital. Surgical Grand Rounds.

*9 a. m. - 10 a. m. Boston Dispensary, 25 Bennet Street, Boston. Social Service Case Presentation. Miss E. R. Canterbury.

9:15 a. m. Massachusetts General Hospital. Neurological Conference. Ether Dome.

11 a. m. Massachusetts Public Health Association. University Club, Boston.

12 m. Massachusetts General Hospital. Clinicopathological Conference.

*3:30 p. m. Medical Clinic at the Peter Bent Brigham Hospital. Dr. Donald J. MacPherson.

8:15 p. m. Trudeau Society. Beth Israel Hospital, Boston.

**Friday, January 29—**

*9 a. m. - 10 a. m. Boston Dispensary, 25 Bennet Street, Boston. Recent Advances in the Surgery of the Chest. Dr. Edward D. Churchill.

10 a. m. Massachusetts General Hospital. Fracture Rounds.

**Saturday, January 30—**

*9 a. m. - 10 a. m. Boston Dispensary, 25 Bennet Street, Boston. Hospital Case Presentation. Dr. S. J. Thannhauser.

*10 a. m. - 12 m. Staff Rounds at the Peter Bent Brigham Hospital. Conducted by Dr. Henry A. Christian.

**Sunday, January 31—**

4 p. m. Free public lecture at the Harvard Medical School, Building D, Longwood Avenue, Boston. "Social Stress and Mental Health." Dr. C. Macfie Campbell.

*Open to the medical profession.
†Open to Fellows of the Massachusetts Medical Society.

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**January 21**—Massachusetts General Hospital. Clinical Meeting of the Staff at 8:15 p. m. Moseley Memorial Building.

**January 26**—Harvard Medical Society. See page 138.

**January 28**—Medical Clinic at the Peter Bent Brigham Hospital. See page 134.

**January 28**—The Trudeau Society. See page 138.

**January 28**—Massachusetts Public Health Association. See page 138.

**February 3**—American Social Hygiene Association. See page 1186, issue of December 17.

**February 11**—Pentucket Association of Physicians. Hotel Bartlett, 95 Main Street, Haverhill, at 8:30 p. m.

**February 12**—William Harvey Society. 8 p. m. Auditorium of the Beth Israel Hospital, Boston.

**February 25, 26, 27**—The New England Hospital Association. Hotel Statler, Boston.

**March 6, June 8 and 9**—American Board of Obstetrics and Gynecology. See page 78, issue of January 14.

**March 30 - April 2**—First International Conference on Fever Therapy. Postponement notice. See page 52, issue of July 2.

**April 21-24**—American Society for Experimental Pathology. See page 1075, issue of May 21.

**July 6-11**—Fifth International Congress of Hospitals. See page 37, issue of January 7.

**October 5-8**—American Public Health Association Meeting. New York City.

**October 25-29**—American College of Surgeons. Chicago, Illinois.

## DISTRICT MEDICAL SOCIETIES

### FRANKLIN DISTRICT MEDICAL SOCIETY

Will meet at the Weldon in Greenfield at 11 a. m. the second Tuesdays of March and May.

CHARLES MOLINE, M.D., Secretary.
Sunderland.

### MIDDLESEX EAST DISTRICT MEDICAL SOCIETY

**March 16**—Danvers State Hospital, Danvers.

**May 11**—Bear Hill Golf Club, Stoneham.

KENNETH L. MACLACHLAN, M.D., Secretary.
1 Bellevue Avenue, Melrose.

### MIDDLESEX SOUTH DISTRICT MEDICAL SOCIETY

**January 27**—See page 138.

### NORFOLK DISTRICT MEDICAL SOCIETY

**February 16**—See page 138.

**March 30**—8:15 p. m. New England Deaconess Hospital. A Symposium on Diabetes entitled "A Survey of the Diabetic Work of the George F. Baker Clinic in the New England Deaconess Hospital." Communications and Case Presentations by the Staff. Drs. Elliott P. Joslin, Howard F. Root, Priscilla White, Alexander Marble and Allen P. Joslin.

**May**—Annual Meeting. Details to be announced.

Note: The Censors will meet for the examination of candidates on the first Thursday of May. Fee of $10.00 is payable at the time of examination. Application blanks may be obtained by writing the Secretary, furnishing name, address and name of school of graduation in medicine. Application must be made at least three weeks prior to date of examination. Candidates whose applications are on file will receive proper notices.

FRANK S. CRUICKSHANK, M.D., Secretary.
1247 Beacon Street, Brookline.

### PLYMOUTH DISTRICT MEDICAL SOCIETY

**January 21**—11 a. m. Bridgewater State Farm.

**March 18**—11 a. m. Brockton Hospital.

**April 15**—Annual Meeting. 11 a. m. Ducy Hospital.

**May 20**—11 a. m. Lakeville State Sanatorium.

FRED F. WEINER, M.D., Secretary.
231 Main Street, Brockton.

### SUFFOLK DISTRICT MEDICAL SOCIETY

**January 27**—See page 138.

**March 31**—Boston Medical Library. 8:15 p. m. "Social Insurance—It Affects the Medical Profession." Dr. Charles E. Mongan. Discussion: Dr. Channing Frothingham.

**April 28**—Annual Meeting. Boston Medical Library. 8:15 p. m. "Problems in Surgical Diagnosis." Dr. Howard M. Clute.

CONRAD WESSELHOEFT, M.D., President,
CHARLES C. LUND, M.D., Secretary.

### WORCESTER DISTRICT MEDICAL SOCIETY

**February 10**—Worcester State Hospital, Worcester, Mass. 6:15 p. m.: Dinner—complimentary by the hospital. 7:30 p. m.: Business session and scientific program.

**March 10**—The Memorial Hospital, Worcester, Mass. 6:15 p. m.: Dinner—complimentary by the hospital. 7:30 p. m.: Business session and scientific program.

**April 14**—Worcester Hahnemann Hospital, Worcester, Mass. 6:15 p. m.: Dinner—complimentary by the hospital. 7:30 p. m.: Business session and scientific program.

**May 6**—At 4:30 in the rooms of the Worcester Medical Library, Inc., at 34 Elm Street, Worcester, will be held the spring meeting of the Board of Censors.

**Wednesday Afternoon and Evening, May 12**—Annual Meeting. Time and place for this meeting will be announced in an early spring issue of the Journal.

ERWIN C. MILLER, M.D., Secretary.
27 Elm Street, Worcester.

### WORCESTER NORTH DISTRICT MEDICAL SOCIETY

**January 27**—Meeting at the Leominster Hospital, 4:30 p. m.

## BOOKS RECEIVED FOR REVIEW

**Applied Dietetics.** The Planning and Teaching of Normal and Therapeutic Diets. Frances Stern. 263 pp. Baltimore: The Williams & Wilkins Company. $3.50.

**Patient and Doctor.** Sir Henry B. Brackenbury. 280 pp. London: Hodder & Stoughton.

**Diseases of the Coronary Arteries and Cardiac Pain.** Edited by Robert L. Levy. 445 pp. New York: The Macmillan Company. $6.00.

**Oral Diagnosis and Treatment Planning.** A Textbook for Students and Practitioners of Dentistry and Medicine. Samuel Charles Miller. 620 pp. Philadelphia: P. Blakiston's Son & Co.

**The Physiology and Pharmacology of the Pituitary Body.** H. B. Van Dyke. 577 pp. Chicago: The University of Chicago Press. $4.50.

**A Synopsis of Surgical Anatomy.** Alexander Lee McGregor. Third Edition. 664 pp. Baltimore: William Wood & Company. $6.00.

**Surgery for Dental Students.** Philip H. Mitchiner, Clement E. Shattock, Edward G. Slesinger, and Cecil P. G. Wakeley. 364 pp. Baltimore: William Wood & Company. $4.75.

**The Principles of Bacteriology and Immunity.** W. W. C. Topley and G. S. Wilson. Second Edition. 1645 pp. Baltimore: William Wood & Company. $12.00.

**Brookings. A Biography.** Hermann Hagedorn. 334 pp. New York: The Macmillan Company. $3.50.

**Les Courants de Haute Fréquence.** Georges Ronneaux. 156 pp. Paris: Gauthier-Villars. 30 fr.

**A Textbook of Medicine.** Charles Phillips Emerson. 1296 pp. Philadelphia, London, Montreal: J. B. Lippincott Company.

**International Clinics.** Edited by Louis Hamman. Volume IV. Forty-Sixth Series, 1936. 352 pp. Philadelphia, Montreal, London: J. B. Lippincott Company.

**On the Incidence of Anaesthetic Complications and Their Relation to Basal Narcosis.** C. J. M. Dawkins. 56 pp. London: John Murray. 3/6 net.

## BOOK REVIEWS

**Medicine and Mankind.** Edited by Iago Galdston. 217 pp. New York and London: D. Appleton-Century Company. $2.00.

The contents of this book are the lectures given at the New York Academy of Medicine last year. The lectures are as follows: "How We Learned About the Human Body", by Benjamin P. Watson; "Medicine in the Days of the Grand Monarch", by Howard W. Haggard; "The Contributions of the Primitive American to Medicine", by Harlow Brooks; "The Common Denominator of Disease", by George Draper; "The Organic Background of Mind", by Foster Kennedy; "The Story of the Vitamins", by Elmer V. McCollum, and "The Mystery of Death", by Alexis Carrel. There is considerable variety in regard to the topics discussed and also the worth of the papers. The chapter by Dr. Haggard is an interesting, amusing account of the various sicknesses suffered by Louis XIV. Written in an entertaining style, this chapter is well worth reading. A somewhat more scholarly presentation is that by Dr. Brooks on primitive American medicine. Here one finds material that has not been accessible before. Dr. McCollum has presented in a clear, readable style the very complex story of the discovery of our present knowledge of the vitamins. Here again one finds in a short essay an excellent account of a single aspect of medicine. Dr. Carrel adds to his distinction in his sound contribution on the mystery of death. He elaborates death from the laboratory point of view, using the latest information on tissue culture and tissue death from the Rockefeller Institute for Medical Research. In general, much of this book is well worth reading and certain of the chapters, as indicated above, can be highly recommended to the medical profession. Although designed for the laity, the book should have a wide appeal to physicians.

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**Williams's Obstetrics.** Henricus J. Stander. Seventh Edition. 1,269 pp. New York and London: D. Appleton-Century Company. $10.00.

This seventh edition of Williams's standard textbook for the use of students and practitioners is a revision and enlargement of the text originally written by him in 1903, and is the first edition which has appeared since his death in 1931. In this revision the editor has undertaken to retain as much of the author's sixth edition as is consistent with new developments in obstetrics. The general plan of the book is unchanged. Three new chapters are added: one dealing with the hormones in pregnancy and the puerperium; one on urinary complications especially pyelitis; and a third on modern methods of anesthesia and analgesia. Many of the earlier drawings have been retouched and a number of new ones have been added. The admirable charts in the chapter on the toxemias of pregnancy were prepared by Dr. C. R. Tew. It is gratifying to see so excellent and well-established a textbook as that of the late Dr. Williams maintained at its standard of value to practitioners and students in this latest edition by a new author.

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**Squint Training.** M. A. Pugh. 117 pp. London: Oxford University Press. $2.75.

It is an interesting coincidence that Pugh's "Squint Training" should appear during the same year which marks the passing of Claud Worth, who did so much to show how the desire for binocular vision may be used to aid in correcting strabismus.

Drawing upon her experience with one thousand cases of strabismus at the Royal London Ophthalmic Hospital, Pugh demonstrates that intelligent treatment is possible only after a careful analysis of the individual problems presenting in each patient. From her series, she offers the following classification of the chief factor in etiology of squint:

Ten per cent show physical defect in media, retina, or central connections.
Fifty per cent show errors of refraction.
Twenty per cent show fusion defect.
Twenty per cent show psychologic causes.

Every ophthalmologist who undertakes the responsibility of treating strabismus should inform himself of the manner in which Pugh studies her cases, employs occlusion, uses orthoptic training before and after surgery, and selects surgery.